1798
XLIII

FLIGHT

and The AIRCRAFT ENGINEER

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OFFICIAL ORGAN OF THE ROYAL AERO CLUB

JUNE 10th, 1943

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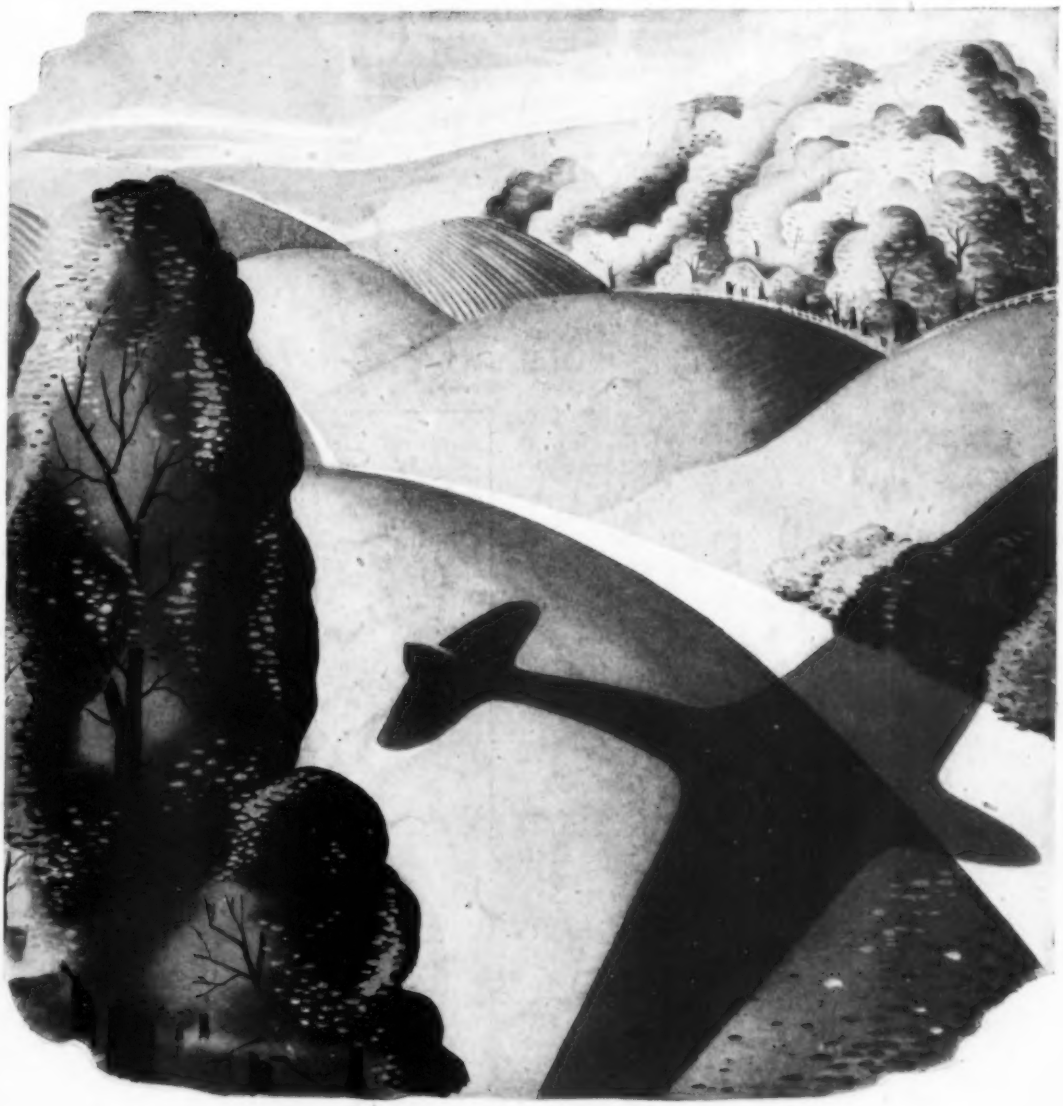

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FLIGHT and The AIRCRAFT ENGINEER

First Aeronautical Weekly in the World : Founded 1909

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The Outlook

The Saviour of Britain

AIR CHIEF MARSHAL SIR HUGH DOWDING is the second officer of the Royal Air Force to receive the honour of a peerage in reward for his services to the R.A.F. The first one, of course, was Lord Trenchard, who was created a Baron after years of work as Chief of the Air Staff, during which he laid the foundations on which the present magnificent organisation has been erected. Sir Hugh Dowding has undoubtedly been made a Baron because he was A.O.C.-in-C., Fighter Command, during the critical Battle of Britain, when the few saved the many—in fact, saved freedom for the world at large. Much has been written about the heroism of those few, and likewise about the merits of the eight-gun fighters which enabled them to master and shatter the great odds sent against them by the enemy. Little, however, has been made public about the tactical direction of the long-drawn battle, of the brains and staff work behind the squadrons of Hurricanes and Spitfires which made that almost miraculous victory possible.

A bad or indifferent General, Admiral or Air Marshal can lose a battle even when he commands superior forces; it takes a very good one to win against greater numbers. In Sir Hugh Dowding and his staff, as well as in the commanders of his Groups, generalship in the highest degree was obviously present. Some day we shall learn all the details of how the Groups supported each other and how the squadrons were deployed so that each attack by the enemy was met and defeated. Seldom has more been at stake, and seldom has masterly handling of gallant fighting men produced more decisive results.

It is a characteristic British habit to pause and cogitate long before rewarding merit in action, and Sir Hugh has had to wait three years before receiving his well-earned peerage; but it is a peerage granted during a war for supremely successful command during that war, and it may be compared with the ancient custom of knighting a particularly gallant squire on the field of battle.

The V.R. Badge

IN announcing the abolition of the V.R. badge from the lapels of officers and warrant officers of the Royal Air Force Volunteer Reserve, the Under-Secretary of State for Air, Capt. Balfour, M.C., stated that it would not be feasible to make a distinction between those who joined before the war and those who have joined it since.

Why should it not be feasible? The reason is hard to see. Anything which encourages men to prepare in peacetime for the defence of their country ought to be encouraged. The American Army has given a ribbon (and presumably a medal to hang on it) to all its members who were serving before the Japanese attack on Pearl Harbour. We should not advocate anything so elaborate as that for a British Service, but still it is a good thing that, so far as possible, a fighting man's record should be set forth on his uniform. The man who learns the business of fighting in time of peace deserves credit and ought to be allowed to proclaim the fact to the world.

There can be nothing but approval for the decision to abolish the V.R. badge in the case of men who join up now. For one thing, it will save a small amount of precious brass metal. Another reason is that since the outbreak of war no regular commissions are granted in the Air Force, and a man could not become a regular officer (with either a permanent or a short-service commission) however ardently he might desire to do so.

All join through the Volunteer Reserve, and there is no point in marking on his uniform the fact that each one has followed the inevitable course.

It is also relevant that there is a distinction between the effect produced by such a badge at the outbreak of war and in the fourth year of war. When war is declared and Auxiliary and Volunteer Reserve forces are embodied, the badges A. and V.R. proclaim to all that the wearer is not a regular, and therefore almost inevitably in some way or other less efficient than a regular. Part-time men cannot be expected to be so efficient as whole-time men. After three years of war, however, when the majority of the Service consists of civilians in uniform, serving only for the duration, it is a distinction to have held a commission or a warrant dating from before the war. The A. badge of the Auxiliary officers shows that they had trained in time of peace to serve their country, and in our opinion those Volunteer Reserve officers who were also commissioned before September, 1939, ought to be allowed to wear a badge which likewise shows their record of service.

A Very Small Mouse

THAT the House of Commons means business when it talks of civil aviation was brought out very forcibly in the full-dress debate on June 1st, which is reported elsewhere in this issue. There was complete agreement that this country must make a start at once if the Empire is not to be left hopelessly behind after the war. There was virtual unanimity that civil aviation should be taken away from the control of the Air Ministry, but Members appeared a little vague as to who should take over. There was anxiety over the absence of young men with flying experience on the board of B.O.A.C. (Mr. d'Erlanger is the sole male representative at present). And there was an insistent demand for an Empire air conference.

The Government mountains, as represented by Mr. Attlee and Sir Archibald Sinclair, laboured mightily—and produced a small mouse in the form of a statement that the aircraft industry has been given orders for the design and construction of four prototypes. A small beginning in all conscience, but still a beginning. It was, perhaps, as much as we could hope for at present. For the rest, the Government has no intention of separating civil aviation from the Air Ministry during the war. It is in consultation with the Dominions about Empire aviation, and there are still vacancies on the board of B.O.A.C., which it is hoped to fill with men of flying experience. Those were the only concrete results of the Great Debate.

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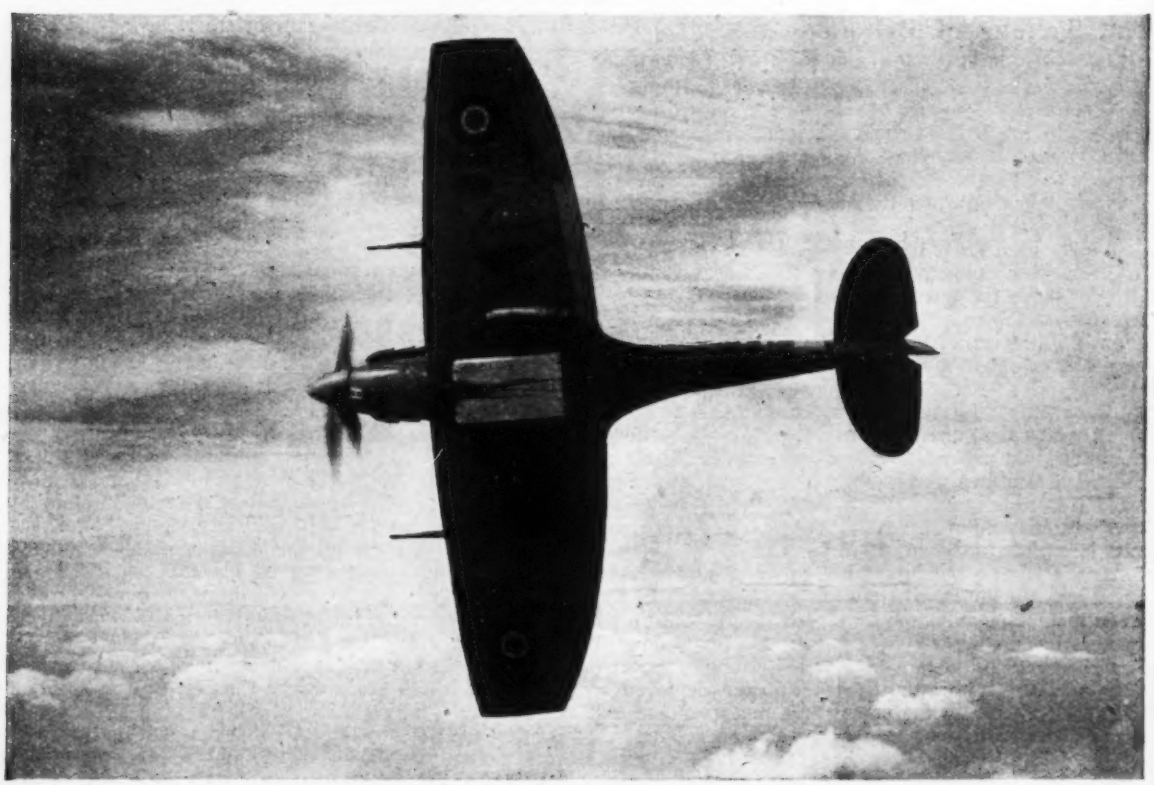


AN UNFAMILIAR PLAN FORM. In spite of its clipped wings, the Spitfire V does not appear to have suffered in its handling characteristics. The practice, now fairly general, of making the wing tips as detachable units facilitates such changes.

War in the Air

COMPETITION ? Nesting storks watch a formation of Mitchells go off to drop their load on Italy.

The Battle of the Atlantic : Luftwaffe Losses : Great Fight by a Sunderland : Tedder's Offensive Continues

THE Battle of the Atlantic goes on unceasingly, but at moments when a great victory like that in North-West Africa is won, the public is apt to forget about the convoys. Now that active Army operations in the Mediterranean area have ceased for a while (though they may have flared up again before these words are published), and matters there have been left in the hands of the Navy and Air Force, it is appropriate to turn our thoughts once more to the Atlantic. Mr. Alexander, First Lord of the Admiralty, was able to give an encouraging account last week of the struggle there between the U-boat and the convoys. He even hoped that the figures for May would show that more U-boats were destroyed during the month than the German shipyards were able to replace.

For some months past the majority of sinkings by U-boats have taken place in the middle stretch of the Atlantic which could not be covered by aircraft based on either the British or the American shores. Now a new type of vessel has been evolved, the escort carrier, several of which are now in service, and they promise to make a great difference to the struggle. Escort vessels, destroyers, frigates and corvettes can make heavier and more effective attacks than aircraft can, when they get near the submarine, but of late aircraft have grown more effective than they once were, and they carry depth charges, which are more potent than bombs. In fact, reconnaissance and reporting are no longer the main function of aircraft in the fight against U-boats, and they have become definitely a major weapon of attack. The appearance of the escort carriers on the central stretch of the Atlantic must be most discouraging to the German chiefs who look on the U-boat as their last remaining chance of victory.

The chiefs of the *Luftwaffe* can be no more cheerful than the directors of the U-boat campaign. The construction of German aircraft is believed to have reached its peak, and to be incapable of expansion except at the cost of other munitions of war—and it is no easy matter to make a switch over of that description. At such a crisis the loss of large numbers of machines without any compensating damage done to the Allies is a serious matter, and the final campaign in Tunisia cost the Axis dear. No fewer than 558 aircraft have been found, either whole or in parts, on the airfields round Tunis, Bizerta and Cap Bon. Since the conclusion of that

Spitfire Nines are now operating from the wire runways on the Tunisian airfields to provide height cover for Allied bombers.

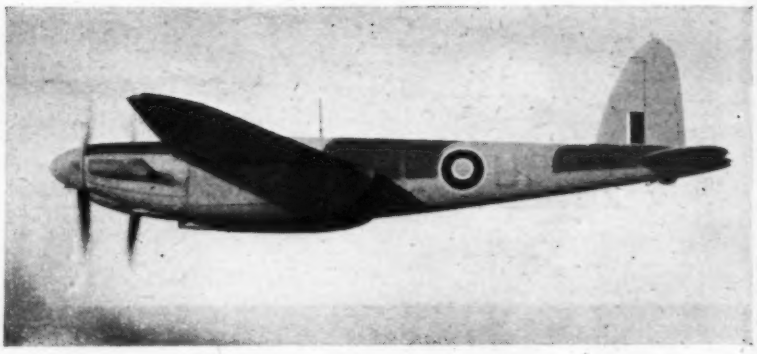
WAR IN THE AIR

campaign large numbers have also been destroyed on the ground and in the air over the Italian islands, and Sir Arthur Tedder's offensive goes merrily on.

Italy's Sorry Plight

THE lack of fighter opposition to the Allied raids on the Italian islands is another indication of the poor state in which the *Luftwaffe* and the *Regia Aeronautica* find themselves. The little island of Pantellaria, which was fortified by Mussolini before the war with the express purpose of hampering British transit through the Sicilian Narrows, is now like a cobra whose poison fangs have been extracted. The Navy has shelled its harbour several times, and Allied bombers have roved over it at will, smashing up the airfields with the aircraft on them, and generally wrecking anything of value to the Axis. Sardinia is in but little better case, while Malta has been taking a heavy revenge on Sicily for all the raids which have started off from there to wreck the town of Valetta.

It is evident from Italian broadcasts that the people of the mainland expect an Allied invasion in the near future and feel utterly unable to withstand it. Germany seems loth to send sufficient reinforcements. The Italian fleet remains "in being," but has no carriers and cannot venture to fight outside the short range of shore-based fighters. Between May 22nd and 28th over 3,000,000 lb. of bombs were dropped by the Allies on various places in Italy and her islands, and some of the damage was exceptionally heavy. Leghorn was one of the worst sufferers, and the important oil refinery there is believed to have been damaged. Altogether, Italy is in a sorry state.



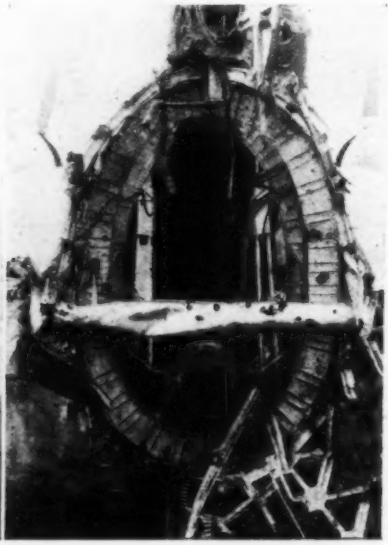
EFFICIENT ELEGANCE : From this three-quarter rear view the Mark II Fighter Intruder D. H. Mosquito shows its sleek outlines.

A Gallant Sunderland

ALTHOUGH the Sunderland must now be reckoned a flying boat of old design and at best not capable of more than 210 m.p.h., it is still a very formidable fighting aircraft. An especially gallant fight by a Sunderland of the Royal Australian Air Force working with Coastal Command deserves to live in any history of the war. The boat was out on patrol over the Bay of Biscay, searching for U-boats, when it was attacked by eight Ju 88 fighters. Incidentally the somewhat extensive conversion of Ju 88 machines from bombing to fighter duties is one instance of the straits to which the *Luftwaffe* has been reduced. The Ju 88 is a very good machine, and far faster than the Sunderland, while the odds of eight to one ought to have made the result of the combat a foregone conclusion. The flying boat was hit in many places, fire broke out but was entinguished, one gunner was killed and four other members of the crew were wounded, among them the captain of the boat, and things must have seemed pretty desperate. But the stout Australian gunners fought back, and definitely shot down three of the Junkers fighters. Another was probably destroyed, and the other four were all damaged. Finally the Germans gave up the fight, and the survivors turned away. The Sunderland flew back nearly 300 miles and reached Great Britain.

There has been what is called a lull on the Russian front, which may or may not be due to German uncertainty as to where the United Nations will strike in the West. There has been plenty of fighting but no great battle, and the arms chiefly used have been artillery and bomber aircraft. Both sides have been using large forces of bombers to strike at targets behind the opposing lines. A while ago the Russians indulged in a spell of long-distance raiding on East Prussia and elsewhere, but like previous outbursts of this sort it did not last for long. Strategic bombing is apparently considered by the Russians to be the concern of the British; they concentrate their attention on land fighting, and use their Air Force accordingly. The Germans have been retaliating in kind, and as yet have shown no disposition to withdraw large contingents of bombers from the Eastern front to take revenge on Britain for the continuous devastation of German industrial centres. The task of making token raids and killing schoolgirls in England has been left to fighter-bombers.

A TALE OF A TAIL : The damaged Vickers Wellington which Sgt. L. Williamson managed to bring back to base after having the rear turret completely shot away. Sgt. Williamson was awarded the C.G.M.



East of Suez

THE American landing on Attu island in the Aleutians may be the first fruits of the announcement in Washington by Mr. Churchill and President Roosevelt that Britain and the United States are now in a position to undertake a campaign against Japan as well as to deal faithfully with the Axis in Europe. The American success on the island is gratifying, and it is also pleasing to hear that Canadian pilots in Warhawks have played a part in the operations.

War news from China has been scanty since Japan succeeded in closing the Burma Road, but lately a substantial Chinese victory on the Yangtze

ENEMY AIR LOSSES TO JUNE 5th

	Over G.B.	Continent	Middle East	N.W. Africa
May 30	6	4	0	14
,, 31	0	2	0	5
June 1	5	5	0	0
,, 2	1	3	0	0
,, 3	0	0	2	0
,, 4	4	1	0	2
,, 5	0	0	0	6
	16	15	2	27

Totals: West, 6,971; Middle East, over 5,343; North West Africa, 1,950.

has been reported. It took place in the provinces of Hupeh and Hunan, and a report from Chungking says that the Chinese and Allied Air Forces achieved air control in the region of Ichang. This news is both surprising and gratifying; but Japan, with her limited aircraft production resources, must be somewhat hard put to it to keep all her many fronts supplied with machines.

General MacArthur's defence by bomber continues to hold the nasty little yellow men at a respectful distance from Australia, but for the time being there is no chance of a speedy reconquest of Burma and capture of Lashio at the southern end of the Burma Road. The monsoon has broken in Burma, and while it lasts the medical officers on both sides are likely to be more busy with sick casualties than with wounded soldiers.

Spezia Bombed

IT was stated above that the Italian fleet remained "in being," but later news may have falsified that statement. On June 5th over 100 Fortresses from General Doolittle's Strategic Force in N.W. Africa made a long-distance raid on the naval port of Spezia (a round trip of some 1,400 miles) and found there three battleships of the *Littorio* class, besides other warshaps and merchant shipping, and they bombed the harbour hard for six minutes. Damage was done, but at the moment of writing it is not known whether any of the battleships was hit.

At the outbreak of war Italy had only two battleships of this class, the *Littorio* (damaged at Taranto) and the *Vittorio Veneto* (damaged in the battle of Matapan), and the mention of a third comes as a surprise. If the United Nations undertake a landing in the Riviera, battleships based on Spezia could interfere with it and enjoy the cover of shore-based fighters while doing so. It is therefore much to be hoped that the raid scored some bulls-eyes. The Fortresses worked by daylight, as they usually do, and the accuracy of their day bombing is now well known, provided that they can see the target. They all returned safely.

BRITISH & U.S. AIR LOSSES to JUNE 5th

	Over G.B. A'crft.	Continent B'brs.	Continent F'trs.	Middle East A'crft.	N.W. Africa A'crft.
May					
30	0	0	1	0	1
31	0	0	1	0	2
June					
1	0	0	1	0	1
2	0	0	5	0	0
3	0	0	1	0	0
4	0	0	1	0	2
5	0	0	1	1	3
	0	0	11	1	9

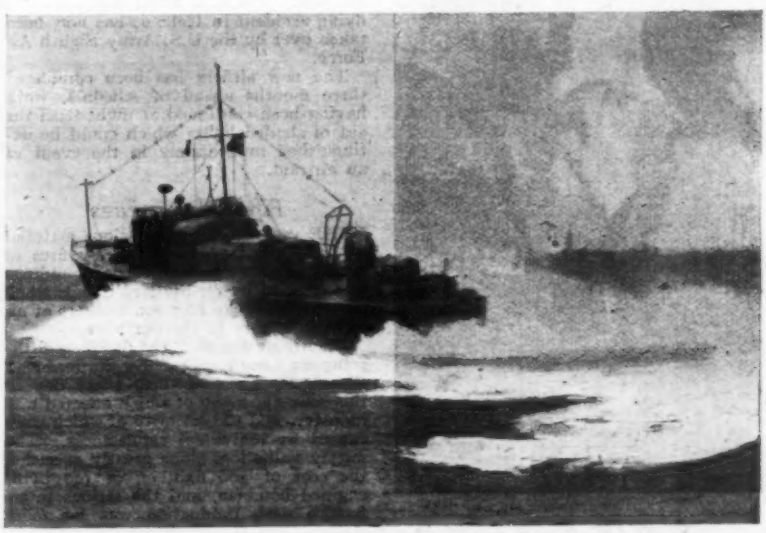
Totals: West, 6,241; Middle East, about 2,095; North West Africa, 719.

Air/Sea Rescue

New Vosper Launch in Service

DESIGNED and constructed by Vosper, Ltd., to meet the special and exacting requirements of the Air/Sea Rescue Service of the R.A.F., this launch, 73ft. overall and powered by two Thornycroft Y.12 type engines of 650 h.p. each, is able to put to sea in all weathers. In addition, two Vosper V8 auxiliary engines of approximately 75 h.p. each are installed, these engines being a conversion of the Ford V8 for marine use. The function of the latter, in addition to driving the auxiliary equipment such as electric generator and bilge pumps, etc., is to provide a relatively slow speed for cruising or manœuvring in harbour at times when the main engines need not be kept running. A high degree of manœuvrability and a maximum speed of 11 knots are achieved on these engines.

The hospital in which the rescued aircrews are carried is arranged in the most suitable part of the boat, amidships, abaft the navigating bridge, and is half sunk into the deck to facilitate access of stretcher cases. The crew usually carried consists of one officer, two N.C.O.s, and eight other ranks. Complete radio equipment is installed to assist in locating the dinghy and its survivors, and for communication with the shore or aircraft in the vicinity.



TO THE RESCUE: The Vosper launch puts to sea at full throttle. The hospital, half sunk into the deck, will be noted amidships.

Speed requirements have been kept down to 25 knots in order to facilitate, with the hull form selected, the combined qualities of reasonable speed and easy riding. This particular hull form was recently developed by the Admiralty and permission to use it was granted by the Director of Naval Construction. The boat is of wood construction and both resin-bonded plywood and laminated wood are extensively used. "Beetle" cold-process plastic cements are largely used as the adhesive. Plastic materials are also prominent in the manufacture of voice pipes, control knobs and bilge pipes, etc.

Three self-sealing fuel tanks are installed. According to Commander P. Du Cane, R.N. (Retired), managing director and chief designer of Vosper, Ltd., fuel consumption at full throttle on the main engines is approximately 80 gallons per hour, and with the auxiliary engines under similar circumstances 11 gallons per hour. Cruising on the auxiliaries at 9 knots gives the launch a long range. Cruising on the main engines at 20 knots the launch can keep at sea for many hours without refuelling.

HERE AND THERE

Chocks Away !

WHEN Lord Londonderry, former Secretary for Air, introduced the new radio feature, "A.T.C. Parade," in the B.B.C. Forces programme, he was the first A.T.C. commandant of any of the eleven commands to speak to the entire corps over the air. He was, of course, recently appointed commandant of the A.T.C. in Northern Ireland.

Air A.D.C. to the King

AIR COMDRE. B. E. EMBRY, triple D.S.O. and A.F.C., who is Air Aide-de-Camp to the King, has been promoted to the rank of Air Vice-Marshal.

It was in 1926 that he was first granted a permanent commission, and during the Battle of Britain he was a fighter pilot. He has also seen active service as a bomber pilot and night-fighter pilot.

Eire's Increased Air Traffic

"SINCE the outbreak of the war there had been a remarkable increase in the number of passengers and weight of goods carried by air," commented Mr. Sean Lemass, Minister for Industry and Commerce, in the Dail (Parliament) in Dublin recently.

The number of passengers carried by Irish Air Lines in 1942 was double that of 1939, although the number of air miles flown had been reduced.

Conference to be Convened

A CONFERENCE to discuss post-war aviation policies is planned by Great Britain and the United States, although the date and place have not yet been decided upon. It is likely, however, that representatives from the Dominions will be invited to attend the conference, particularly Canada, owing to her essential strategic location on Transatlantic and Transpacific air routes.

Workers Share Ideas

WORKERS' representatives from a group of factories making Lancaster bombers have met in Stafford, and it has been decided to pool, every month, all ideas submitted to the Joint Production Committees.

This meeting is believed to be the first of its kind, and the sharing of such suggestions should prove very helpful.

U.S. Production

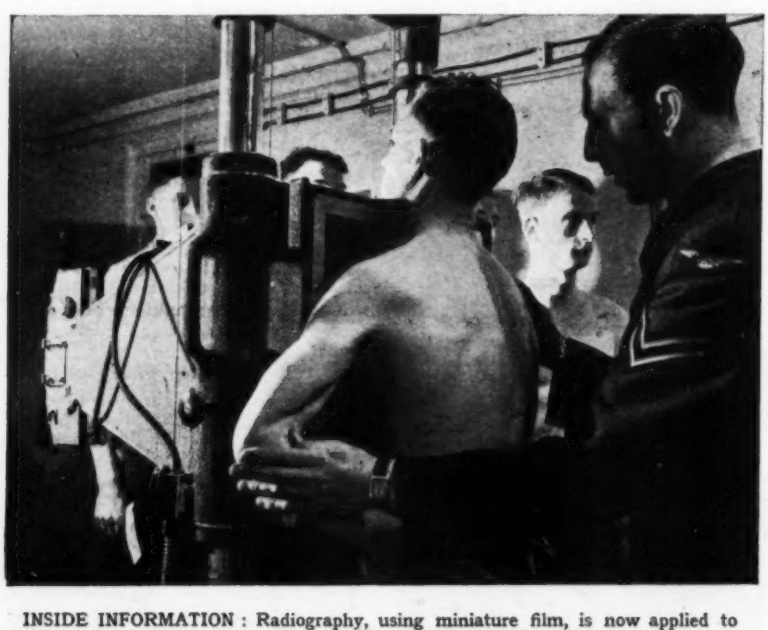
THE 100,000th warplane to come off the production line was completed in America recently, and enough bombs have been made in that country for 542 raids of the size made by the R.A.F. on Dortmund a fortnight ago.

These facts, as well as the disclosure that American bomb production has reached 1,084,000 tons, have been revealed by Mr. James F. Byrnes, the new Director of War Mobilisation in the United States.

Increased American Output

A SPEED-UP in the aircraft production programme of America will result in a monthly output of more than 1,000 four-engined bombers, according to Mr. Charles Wilson, vice-chairman of the War Production Board.

This increase should have effect from now on.



INSIDE INFORMATION : Radiography, using miniature film, is now applied to cadets at an aircrew receiving depot. The result is projected on to a screen and any betraying suspicions of T.B. are re-photographed on full-sized X-ray material.

Seacopters ?

SUCCESSFUL tests are said to have been carried out in Long Island Sound, America, with liberty ships equipped with small decks for the use of helicopters.

The tests were carried out by Col. H. F. Gregory, of the U.S. Army Air Force, who made twenty-four take-offs and landings, using a landing stage measuring 20ft. square which had been installed on a tanker.

The helicopter was fitted with pontoons with which it could alight either on sea or on the deck of a ship.

Madagascar Airgraphs

THE Postmaster-General has announced that, as from June 1st, 1943, airgraph letters addressed to civilians in Madagascar will be accepted. A similar service to H.M. Forces in Madagascar is already in operation.

The charge for airgraph letters addressed to civilians is 8d.

Congratulations to Dortmund Bomber Crews

A MESSAGE from Air Chief Marshal Sir Arthur Harris, C.-in-C. of Bomber Command, has been received by the crews who took part in the raid on Dortmund recently. The message said:

"In 1939 Goering promised that not a single enemy bomb would reach the Reich. Congratulations on having delivered the first 100,000 tons of bombs on Germany to refute him. The next 100,000, if he waits for them, will be even bigger and better bombs, delivered even more accurately and in a much shorter time."

New U.S. Airfield in Britain

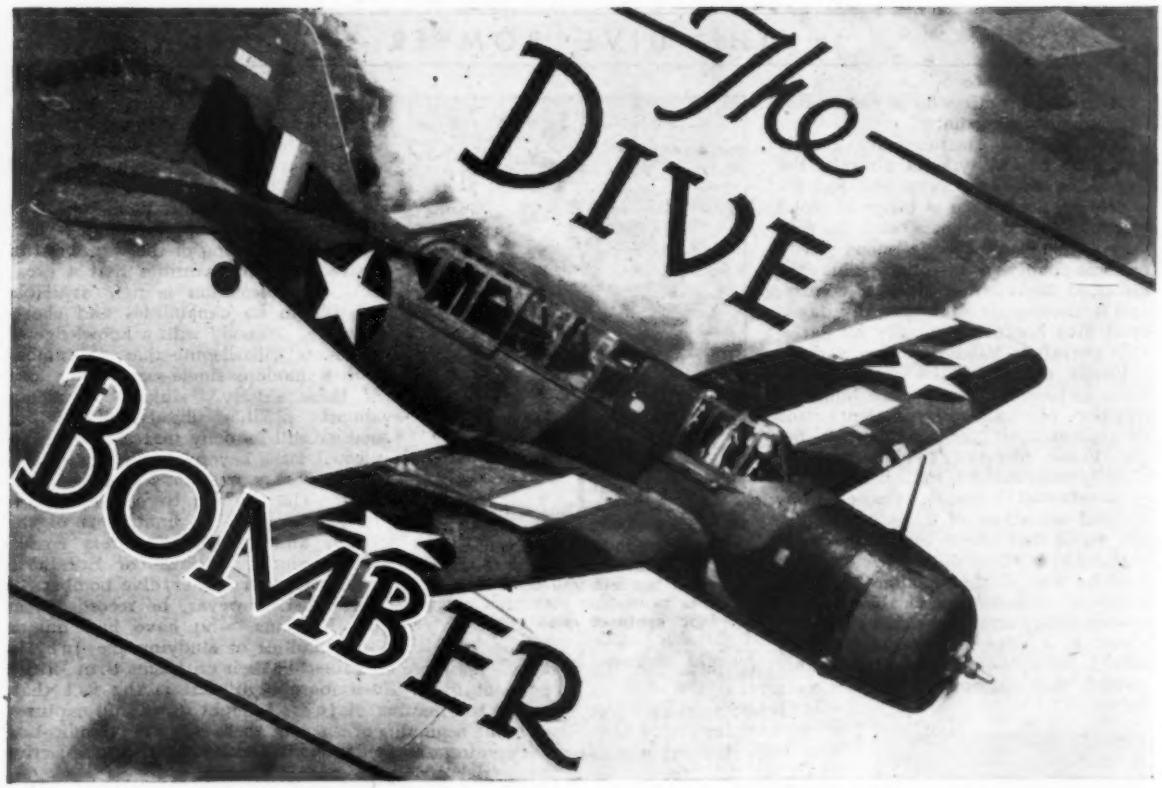
THE first American-built airfield in Britain, which has been dedicated to the late Lt. Gen. Frank Maxwell Andrews, who was killed recently in a flying accident in Iceland, has now been taken over by the U.S. Army Eighth Air Force.

The new airfield has been completed three months ahead of schedule, work having been continued at night with the aid of shaded lights which could be extinguished immediately in the event of an air-raid.

Fifth-column Fires

THE vast wastage of precious material and effort being caused by fires in factories and other industrial buildings was stressed by Sir Stafford Cripps when he recently spoke to 5,000 workers at an aircraft factory in the north-west.

Describing fire as "the deadliest fifth-column among us now," Sir Stafford said there were 1,000 of them every day in this country, many of which affected war industry, and the majority of which were caused by individual carelessness. The money value loss alone greatly exceeded the cost of 400 fighters, or 100 twin-engined bombers, and the serious interference with production was far more serious than the monetary loss; he appealed urgently for everyone to help to put a stop to this terrible wastage.



Its Design, Development and Application : Fighter Dive Bombers : Adapting Four-engined "Heavies"

By "HELLDIVER"

IS the dive bomber dead? There are many who are prepared to say "Yes!" In this article the author sets out to show that, although the dive bomber as represented by the Ju 87 class may be said to have become outmoded, it would be rash to assume that improved types may not change the picture. Against shipping, the dive bomber can be a formidable weapon and may yet play an important rôle in the war.

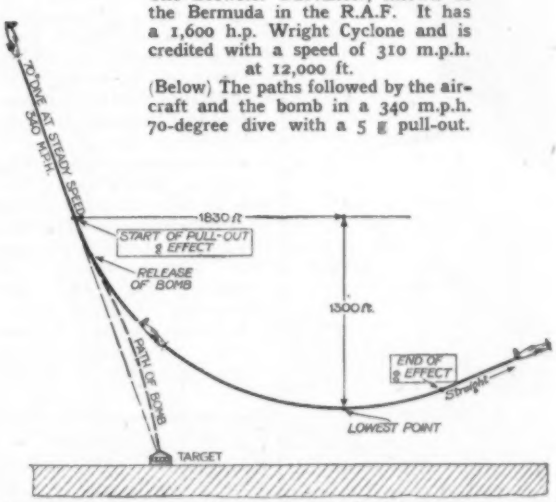
NOT to define it too academically, dive bombing is a form of attack in which the bomb is released from an aircraft diving in the direction of its target. Unless the dive is truly vertical (which, as precise control is not possible, is rarely the case) allowances must be made for gravitational pull on the bomb and for air resistance. This is usually achieved by release at a previously determined point on the pull-out radius; alternatively, compensation for the "lag" of the bomb may be effected by its release while the aircraft is being aimed at a point beyond the target. In either case wind must be taken into account.

Thus the conditions governing dive bombing are essentially those of fixed gunnery, in which the pilot must contend with the "drop" of the projectile.

Obviously the bombing dive should be as steep as possible consistent with good handling qualities of the aircraft, for the greater the angle the less will be the allowance for the curve of the bomb trajectory.

Specialised aircraft in use to-day can attain angles of 80 degrees and more, but somewhat shallower angles (50-70 degrees) are more common. The steep aiming dive, particularly if it follows carefully planned evasive action during the approach to the target area, lessens the chances of A.A. defences.

The Brewster Buccaneer, known as the Bermuda in the R.A.F. It has a 1,600 h.p. Wright Cyclone and is credited with a speed of 310 m.p.h. at 12,000 ft.
(Below) The paths followed by the aircraft and the bomb in a 340 m.p.h. 70-degree dive with a 5 g pull-out.



Provided accuracy is not to be prejudiced by releasing the bomb at too great a height a steep dive will entail a sharp pull-out; this has necessitated the development of aerodynamic brakes, which are now standard equipment on all types of dive bombers.

Degree of Accuracy

The main advantages offered by dive bombing are a higher degree of accuracy than can be guaranteed with high or medium-altitude ("precision") bombing and greater penetration than is possible with low-level bombing. The possibility of the bomb "bouncing" over its objective as in low-level bombing is eliminated.

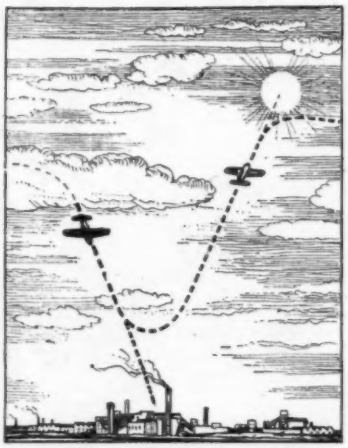
In true dive bombing as at present practised it is the

THE DIVE BOMBER

pilot of the aircraft who is responsible for releasing the bombs.

Dive bombing tactics vary greatly according to the type of aircraft, the size of the attacking formation, and the weather. Advantage is taken of cloud to confuse A.A. defences, and the dive may be made in several "steps," with periodic changes of direction. This calls for good aileron and elevator control, and in consequence the specially developed dive bomber is usually an agreeable aircraft to handle.

Public critics of the dive bomber have included not only an astonishing number of outraged amateurs and omniscient "air correspondents," but Air Force officers of high position. Usually their antagonism is based on the circumstantial evidence presented by isolated operations of this war, but one can recall that about five years ago a high-ranking officer of the R.A.F. stated that he was of the opinion that dive bombing was not practicable because contemporary aircraft reach such a high speed in a dive that great difficulty would have been experienced in pulling them out, if, indeed, they did not break up in the air!



According to the direction of wind the pilot decides whether to come out of sun and into cloud or vice versa to use the maximum cover for approach and getaway.

It is noteworthy that recent criticisms have likewise been directed not so much at the theory or practice of dive-bombing as a method of attack (it having been demonstrated by the enemy that a very high degree of accuracy is attainable) as at the vulnerability and limited usefulness of what is generally visualised as a typical dive-bombing aircraft. The noisiest critics appear to have no conception of the great variety in size, design and tactical purpose of modern types, and almost invariably the senseless dogma "dive bombers are too vulnerable" is directed at only one aircraft—an enemy type, old in design, of low performance, poorly armed, and, until comparatively recently, handicapped by a serious lack of armour and of leak-proof petrol tanks.

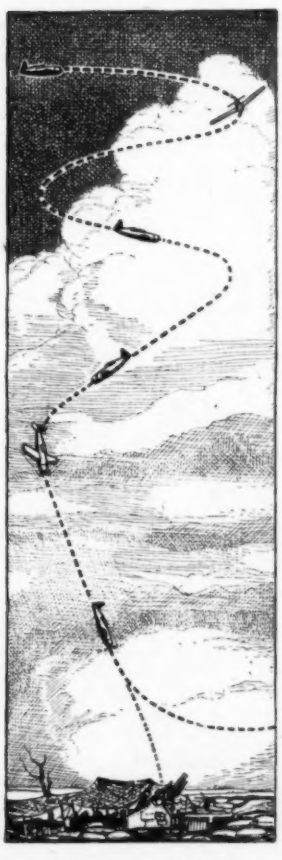
The machine in question—the Ju 87 "stuka" (*sturzkampflugzeug*) — has, since the beginning of the war, been in action in such quantities that a great deal of information is now available relative to its capabilities and shortcomings. Nobody with a knowledge of the facts will dispute that, in combat with a modern single-seat fighter, one of these elderly "stukas" is at an almost pitiable disadvantage; but neither will he deny that it has accomplished tasks beyond the power of any contemporary weapon, aerial or terrestrial. The German High Command is fully aware of the limitations of the Ju 87, and its manufacturers ceased years before the Battle of Britain to refer to it as a fighter/dive bomber.

It must, however, be recorded that the Russians, who have had unique opportunities of studying the Ju 87 in action, are more restrained in their criticisms than British commentators. Even more significant is the fact that, despite the number of Ju 87s brought down and captured since the beginning of the war, there is as yet no indication that an aircraft of this type has been subjected to objective flying trials by the Royal Air Force.

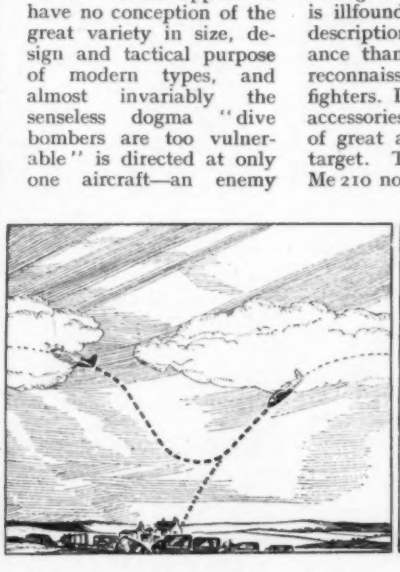
Dive or Attack Bombers?

Condemnation of the Ju 87 on specific technical grounds usually concerns its obviously poor defensive armament by comparison with the American-style "attack bombers"; these latter are twin-engined aircraft of higher power and of much more modern design, but more difficult and costly to build and incapable of delivering the steep diving attacks which alone permit something approaching pin-point accuracy to be combined with high penetration.

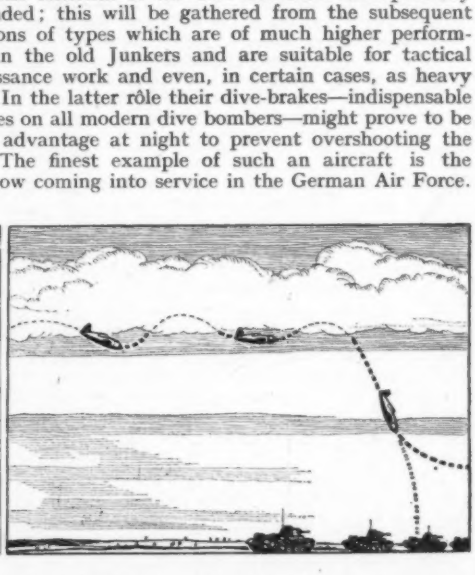
Dogmatic criticism of the dive bomber's inadaptability is illfounded; this will be gathered from the subsequent descriptions of types which are of much higher performance than the old Junkers and are suitable for tactical reconnaissance work and even, in certain cases, as heavy fighters. In the latter rôle their dive-brakes—indispensable accessories on all modern dive bombers—might prove to be of great advantage at night to prevent overshooting the target. The finest example of such an aircraft is the Me 210 now coming into service in the German Air Force.



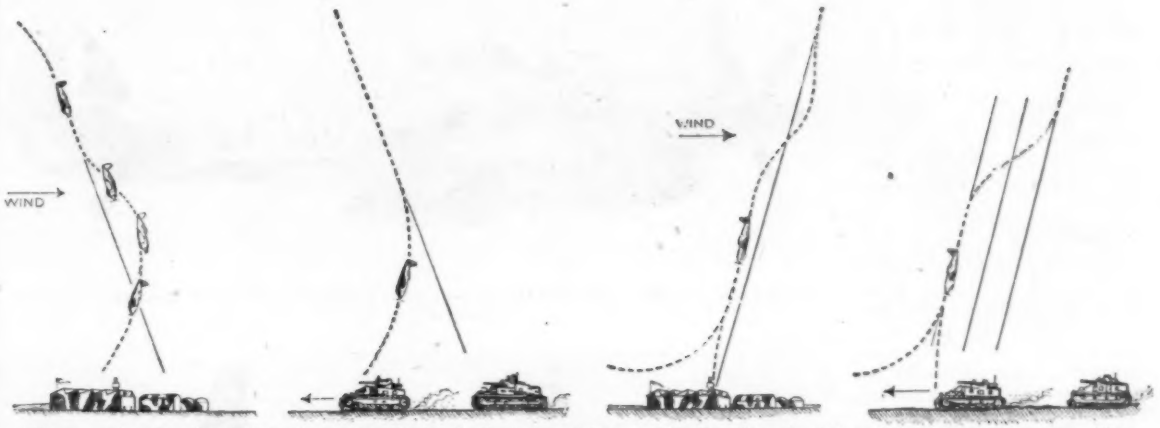
In clear sky conditions the approach is made in as erratic fashion as is possible.



When low, broken clouds are about, the dive bomber can attack from cloud cover.



In 10/10 cloud conditions the lone dive bomber comes out of the cloud for short periods to position himself for the final attack.



Diagrams showing the right and wrong methods of attack in relation to the direction of wind and the movement of travelling targets.

Much has been said of the vulnerability of dive bombers to small-arms and light A.A. fire during the final stage of their aiming dive and during the ensuing getaway. Here, again, the student of the facts will not dispute that extensive destruction has been wrought among the Ju 87s and Ju 88s by resolute ground fire and by other measures intended primarily for defence against low-flying aircraft. Nevertheless, it has not been proved that losses have been disproportionate to the results obtained (particularly against marine targets) nor to the losses incurred in other forms of attack entailing low flying. Under conditions which must frequently obtain the steeply diving aircraft is, in fact, less vulnerable than the low-level bomber. Furthermore, even if hit by ground fire, the dive bomber, with its exceptionally sturdy structure, has a better chance of survival than other classes of aircraft. Photographs have been released by the German Air Ministry of Ju 87s which have sustained astonishing structural damage and yet have regained their bases.

Physical Aspects

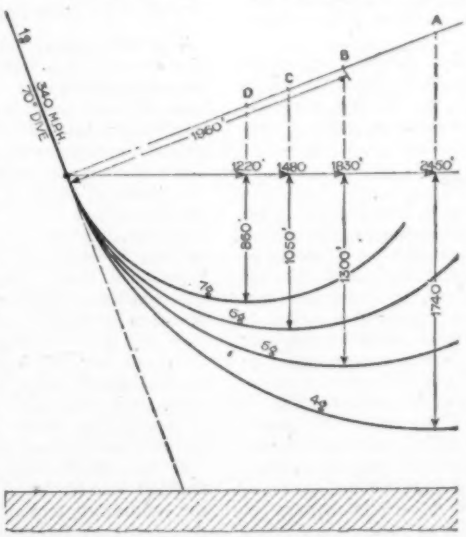
It is not denied that, for the manning of dive bombers, personnel of high courage and of great physical endurance are essential; but of courage there is a limitless supply, and concerning physical endurance, it may be said that the alarming distortions to which the human frame is shown to be subjected in popular films of test diving are not normally encountered in modern dive bombing.

When undergoing contractor's trials a dive bomber prototype may by subjected to an acceleration of 9 g., but this is not approached on operations or during training. A value of 3.5-5 g. is comparatively common and can be endured for a short time by a person of normal physique without "blacking out." The latter phenomenon, which results in temporary loss of vision, is caused by the blood being drawn from the head during the pull-out. The effect of the dive itself is a minor one, resulting only from the rapid change of air pressure.

A modern dive-bomber pilot must, nevertheless, possess an astute brain, not only to decide rapidly on the tactics to be adopted against a particular target, but to perform during the heat of an action a number of operations necessary for the safety of his aircraft. Devices have been evolved to relieve him of certain responsibilities, but these are found mainly on the multi-engined types, such as the Ju 88.

On a typical single-engined dive-bomber it is necessary, before starting the dive, to adjust the blower change and airscrew pitch levers; to close the radiator or cowling flaps; throttle back; operate levers to apply the dive-brakes and trim-tabs; and possibly to restrict the movement of the control column to avoid undue application of "g." during the pull out. Although the mere pressing of a button on the control column may release the bomb (or bombs if a salvo has previously been selected on the bomb distributor) and set the elevator tab to the pull-out position, this must be followed by the retraction of the dive-brakes, the release of the control column to give full range of movement, and by the readjustment of the cooling system to prevent overheating.

The suggestion is often made—usually by those who are now trying to justify their previous antipathy or antagonism to dive-bombers—that fighters armed with guns of 30-40 mm. calibre are as useful for army support as aircraft in the class of the Ju 87. Whilst this may be true when the target is mobile and vulnerable, it is difficult to visualise the blocking of an important cross-roads, the uprooting of a heavy gun emplacement, or the destruction of an underground headquarters (still less the disablement or sinking of a large warship) by any known, or projected, combination of gun and aircraft. It is often conveniently overlooked that the reviled Ju 87 can deliver a projectile weighing a ton or more with great accuracy and force.



Graphs showing the height loss and "g." effect experienced in pulls-out of different radii.

Bomb Penetration

Here a word may be said in reply to the allegation that the penetration of a bomb released from a dive bomber is less than that of a similar projectile dropped with the aid of a precision sight in level flight at a great altitude. The obvious answer is that this is offset by the greater accuracy obtainable with dive bombing, but an even stronger argument is possible now that rocket-propelled bombs have been introduced. The design of such bombs is particularly favourable to their employ-

THE DIVE BOMBER

ment from dive bombers. The Russians use them against tanks from specially armoured aircraft which are not equipped with dive brakes.

For anti-tank work there is much to be said for the single-seater fighter/bomber such as the Hurricane IID. Even so, despite the inference of a recent official communiqué, the "Hurribomber" must inevitably be seriously handicapped by its lack of dive-brakes once it departs from its normal function of low-level, shallow-dive bomber and aspires to the "Hell-dive" variety of attack.

Mention must also be made of the obsolescent single-seater biplane fighters such as the Hs 123 and C.R. 42, which have been adapted for dive bombing by Germany and Italy respectively. Such types do not require brakes to limit their diving speed, as their structures present a higher drag than those of modern monoplanes. Moreover, their exceptional manœuvrability is of great benefit in evading ground defences after the release of the bombs and subsequently in "shooting up" ground targets. Their small bomb load and short range are, of course, disadvantages.

THIS ? The Hurricane IID, with two 40 mm. cannon, which has done such good work in Africa against enemy armour.

OR THIS ? The Vultee Vengeance dive bomber in production for the Royal Air Force. It can carry 1,700 lb. bombs stowed internally.

Whatever the true value of dive bombers may be (if, indeed, they may be judged as a class), their merits must be accepted, at least in some measure, if only for the reason that modern types are in production for the Allies.

It must also be considered significant that Germany and Italy, with their long experience of dive-bomber design, are increasing, rather than slackening, their efforts to evolve more effective types.

As it is the primary purpose of this article to examine, as far as possible, the special attributes of the dive-bombing aircraft of the various Powers, an outline must be given of the applications of dive bombing in modern warfare and of the main channels of design.

Close Support

By land the dive bomber has, up to the present, been utilised mainly as an army-support weapon for the reduction of strong points, the disruption of lines of communication and defence, and the destruction of bodies of troops, transports, gun emplacements, headquarters and similar targets. Long range is not generally required, except for reinforcement purposes, and the army-support dive bomber of to-day is typically a single-engined, two-seater monoplane of very sturdy construction, capable, by virtue of having special aerodynamic dive-brakes, of attacking at angles up to, and including, the vertical and of being brought out of the dive in a small radius and consequently at a low altitude. Fitted with supplementary fuel tanks and carrying a reduced bomb load, it may, under certain conditions, present a serious menace to strategical targets such as docks, railway stations and other vital installations. Operations against these targets will usually demand a strong fighter escort, but this seems to have become a normal requirement of any bomber force operating in daylight over territory defended by fighters.

It would appear that the single-engined arrangement will remain in favour for close-support dive bombers, but it is probable that the twin-engined layout will also be adopted, though on a more limited scale, use being made of two power units of moderate output. An aircraft on the lines of the German Hs 129 ground-attack machine suggests itself.

Twin-engined Advantages

The twin-engined dive bomber offers a much improved view for the approach and final aim, and there is the incidental possibility of survival on one engine—a consideration of some importance, as the power plant of a dive bomber is the most vulnerable item during the dive. Simplification of bomb-ejection problems (there being no airscrew to clear, provided the bombs are carried in, or under, the fuselage) is another benefit to be derived from this arrangement.

For marine use, other than coast defence, the dive bomber is likely to remain a fairly small, single-engined type, as it must operate from, and be stowed in, an aircraft carrier. Except for the provision of arrester and flotation gear and of wing folding, there is no reason why the deck-landing dive bomber should not resemble the single-engined, land-based, army-support type. In this connection mention may be made of the Brewster Bermuda, which, ordered by the R.A.F. for land operation, is identical in basic design with a carrier-borne aircraft adopted by the U.S. Navy.

It is, perhaps, not generally appreciated that the two-engined, carrier-based dive bomber is by no means beyond the bounds of technical possibility, and it has even been reported that Japan has for some time been endeavouring to evolve an aircraft of this class. The main factors governing the operation of such a type are the strength of the

THE DIVE BOMBER

carrier's deck and the minimum dimensions for stowage.

A dive-bombing development of the American Grumman "Skyrocket" single-seater twin-engined fighter appears to have much to recommend it.

Although reference has been made to the potentialities of the single-engined dive bomber for attacking strategical and commercial targets, this work is normally assigned to larger twin-engine types which, although not suitable for such steep dives as the smaller models, can handle loads two or three times as heavy. Their drawbacks of a comparatively shallow permissible diving angle and greater pull-out height can largely be nullified by the use of special sights and computers which are not available on the smaller single-engined machines; even so, it is frequently contended that such types as the German Ju 88 and Do 217 cannot strictly be categorised as dive bombers because they are not suitable for vertical diving. This denotes ignorance of modern technique, for the true 90-degree dive, in which the flight path of the aircraft coincides exactly with the line of sight and trajectory of the bomb, is exceptional, even in the case of the most highly specialised single-engined machines. A more normal angle is 65 degrees.

On the other hand, it is erroneous to classify as dive bombers those aircraft which are not specially equipped for steep diving, but are used for "power glide" bombing approaches at a flat angle. One recalls an American communiqué which mentioned a "dive-bombing" attack on an enemy submarine by a Catalina flying boat!

The credit for having developed heavy, twin-engined aircraft fitted with dive-brakes, capable of bombing at an angle of 60 degrees, or even steeper, of delivering a bomb load at least twice that of contemporary single-engine types, and of operating over much longer distances, must go to Germany. The class of aircraft just described is typified by the Ju 88 which, despite its special construction and the equipment demanded, has demonstrated a high performance in relation to engine power, and can be more effectively armed than the two-seater single-engined.

On more than one occasion Ju 88s have made dive-bombing attacks at night.

Dive-bomber "Heavies"

The development as dive bombers of much larger aircraft than the Ju 88 (particularly the He 177) is reported to be proceeding in Germany, if not in other countries. Dive bombing, even at 45 degrees, by an aircraft carrying a projectile load of six or seven tons, calls for meditation on the part of naval authorities.

The problems associated with the design of dive bombers, particularly of the size of the He 177, are varied and complex. This will be understood when it is realised that until a few years ago steep dives were maintained only for a few hundred feet and were regarded as aerobatic and fighting manœuvres to be undertaken solely by small aircraft. Consequently, development has in the main been undertaken by a comparatively few specialist firms.

In Germany the Junkers concern has been in a peculiarly advantageous position; not only has it received for many years the solid support of the German Air Ministry, but it constructs the engines, and in many cases the airscrews, of its dive bombers in addition to the airframes. Each of these three items presents its peculiar problems, and it must have proved a distinct advantage to have had research grouped in one organisation.

From the structural viewpoint the first requirement for dive bombing is great strength to withstand the strain of the pull-out and of evasive manœuvres. This alone results in a poorer disposable load than would be obtainable were the aircraft not designed specifically for steep diving.

Additional weight results from the dive-brakes themselves, and from the design of the structure to which the brake loads are transmitted.

Aerodynamic design may suffer in the attainment of a good view from the pilot's position, and it may be considered necessary to fit a transparent panel in the floor for the observation of the target during the approach.

Control surfaces must be particularly strong and provide adequate power of manœuvre for aim-adjustment in the dive.

On a conventional single-engined design strong points must be provided for anchoring the ejector arms which guide the bomb clear of the airscrew.

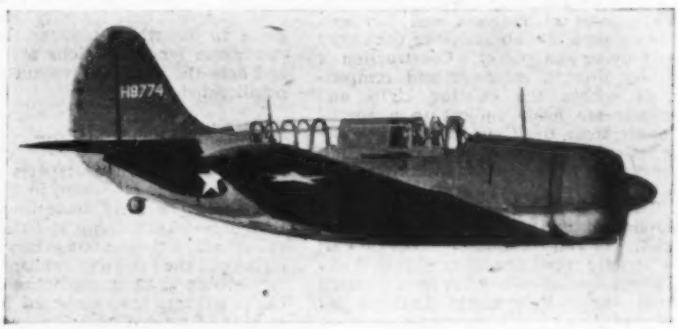
The design of dive-brakes presents special difficulties; they must not create violent eddies and thus cause tail buffeting or wing flutter, nor must they affect aileron control. The control surfaces must be of ample area and, if a device for initiating the pull-out is fitted, elevator tabs must be designed accordingly.

Due to the vulnerability of liquid-cooled engines when installed in a conventional manner, preference may be given in future to air-cooled power plants, unless advantage is taken of the cowling shape made possible by the liquid-cooled unit to apply protective armour in an effective manner. Internal radiators will also be desirable, but these, and the comprehensive armouring of the engines themselves, will mean greatly increased weight, which can be ill afforded on dive bombers. These are already the heaviest aircraft in relation to their size.

At the moment liquid-cooled engines are standardised for German dive bombers and air-cooled units on American aircraft of comparable type.

Some of the main problems encountered in adapting power plants for dive bombing will be dealt with in next week's issue, followed by a review of German types of dive bomber.

GERMANY'S LATEST: A model of the Messerschmitt Me 210. It has the performance and armament of a fighter and carries the bombs internally in the nose.



AMERICA'S LATEST: The 1,700 h.p. Wright Cyclone-engined Curtiss A 25 used by the U.S. army. It is a modified version of the Navy Helldiver.

Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Jap Gliding

A REPORT from Tokyo states that, flying a Japanese-built glider, Tadao Kawewe stayed in the air for 13 hr. 38 min. 5 sec. He thus improved by 2 hr. on the present Japanese duration record.

Verboten

AN order issued by the Military Commander of Belgium and Northern France prohibits all activities connected with flying and gliding. Construction of model aircraft, meetings and competitions within the existing clubs and schools are made subject to a special permit from the Chief of Military Administration, and from June 1st all clubs must supply the German authorities with a detailed list of their members.

The publication of any printed or duplicated matter dealing with flying, gliding or construction of model aircraft is strictly prohibited, except in cases where a special permit has been obtained from the "Propaganda Division for Belgium."

Scientific Looting

THE Nazi Commissioner for Armament in Holland issued a decree foreshadowing the formation of a special Armaments Supply Committee for the purpose of a further mobilisation of Holland's materials and industry intended for the German war machine.

The Committee, which is under the chairmanship of E. Fiebig, with Vice-Admiral Lambrecht as permanent deputy, will direct the planning of all "necessary measures."

Air Transport

BECAUSE of acute shortage of fuel, the Danish Air Transport Company has had further to restrict its activities. Despite the increased demand, the passenger service Copenhagen-Bornholm is to be limited and only preferential passengers are to be taken.

To enable the company to cope with the requests for accommodation on the reduced services, the Minister of Transport ordered that priority should be given to essential journeys. For other passengers no reservations are accepted and only the remaining vacant seats will be allocated.

Less Rubber

A SWEDISH source reports that 150 inhabitants of Askim, in the county of Östfold (Norway), have been sent to the concentration camp at Grini. Practically all of these are workers and officials of the Askim rubber factory, specialising in the manufacture of tyres. Other workers have managed to escape, so that at present only five men are left in the factory.

Recruiting Drive

THE Paris Broadcasting Station announces that the *Luftwaffe* graciously accepts Frenchmen for the N.S.K.K. motorised corps. In fact, for some time efforts have been made to replenish the *Luftwaffe's* depleted manpower from non-German sources, but the repeated recruiting drives in France appear to show that they met with little success.

Frenchmen between 18-50 years of age who are willing to join must hold "national" views and must be willing "to help in the construction of the New Europe." Drivers and ex-Servicemen are especially wanted.

In return, the *Luftwaffe* promises good pay, child bonuses, social insurance and medical service for families. The recruiting office is at 1, Rue Godot de Mauroy, Paris IX.

Small Medal

FOR the first time since the Nazis organised an "independent" Croatia, a Croat woman pilot, Katarina Matanovic-Kulenovic, has been decorated with the small silver medal for courage.

To combat the growing guerilla activities in Southern Croatia, the Germans and the Croat quislings are forced to employ aircraft, and it is in these operations that Madame Kulenovic employed her skill in taking supplies and food to isolated Axis units in "regions temporarily in difficulties."

Slave Training

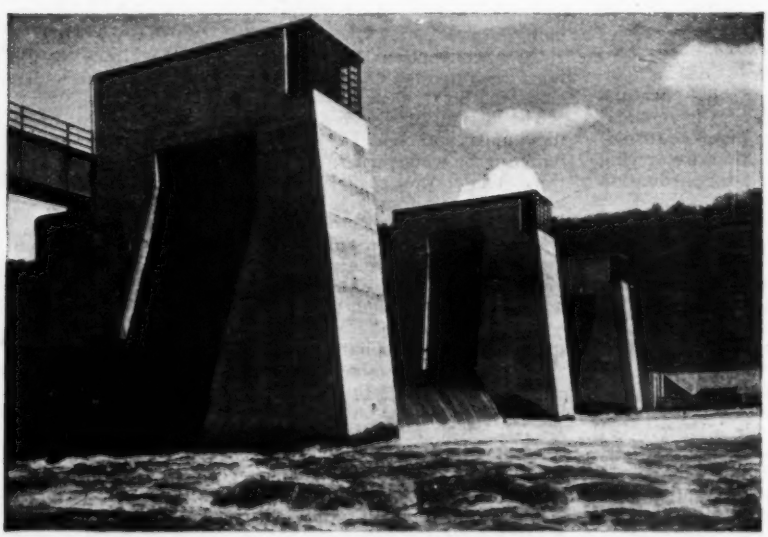
A RECENT feature in the German efforts to secure skilled workers for their migrated industries and for the slave market in Germany is the establishment of training centres in the occupied and satellite countries. In conformity with this scheme, it is reported from Rumania that two German schools for industrial apprentices in Sibin and in Giarmata are to be established during the current school year.

Reflections

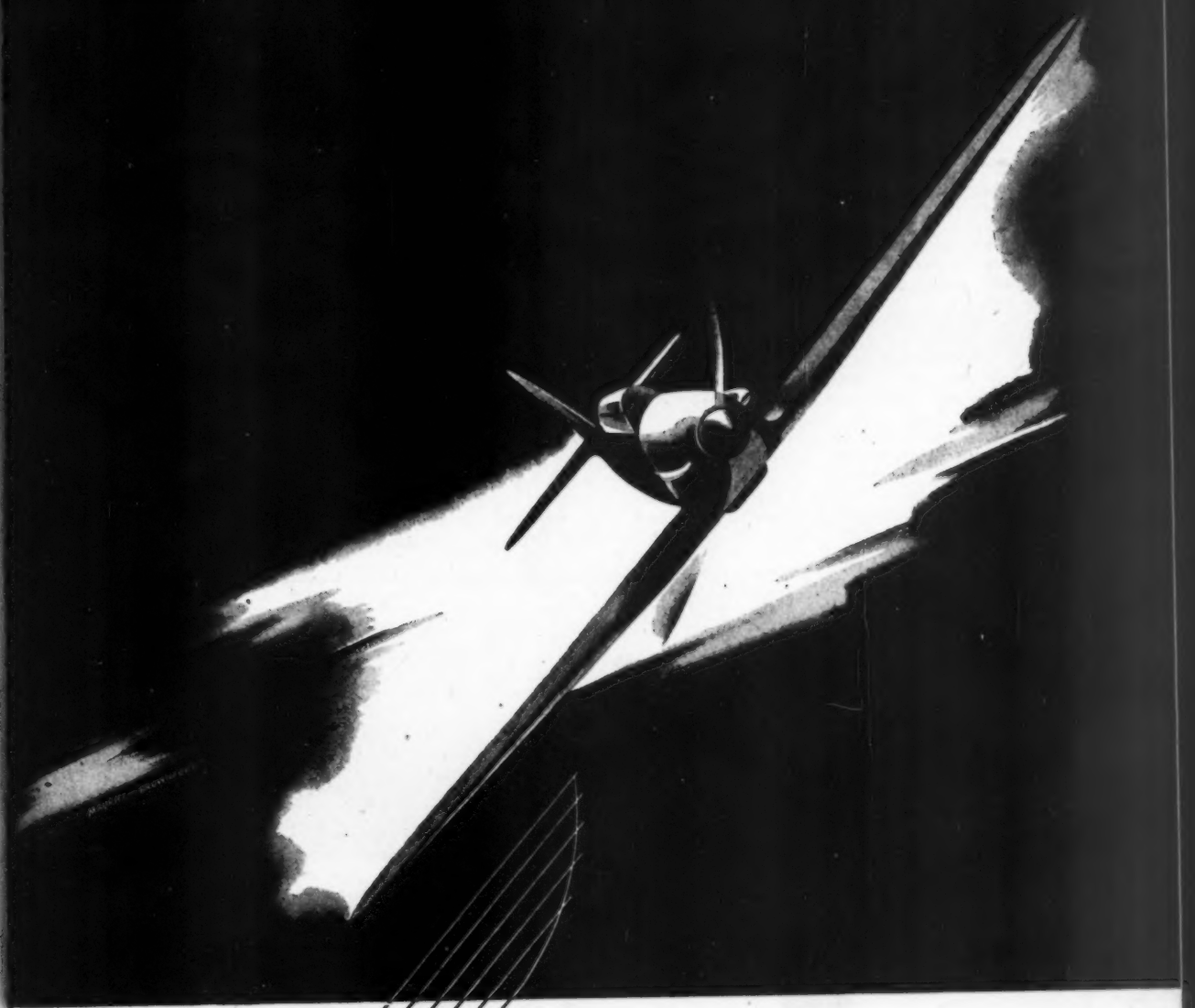
THE North African victory seems to have thrown out of gear the usually smooth and co-ordinated matter of German commentaries. Even in Germany it is difficult to expect people to appreciate an heroic saga only a few months after Stalingrad. The comments are therefore confused and contradictory—a sure sign that this time Dr. Goebbels just did not know what to say.

The Axis forces in Russia say: "The enemy superiority in men, arms, tanks and ammunition could not defeat them, it simply crushed them." It goes on assuring its readers " . . . that we have lost ground but we have gained glory."

The provincial papers say that "It was not the numerical superiority of the enemy, nor his arms or ammunition, which put an end to the Tunisian campaign, but solely the difficulties in supplies"; and the notorious *Angriff* complains that "ultra-clever people and enemy propaganda will argue that we try to give a somewhat meagre and belated explanation of the African issue, and that we invent the excuse of the weight of numbers after the event. But one counter-argument is that during the fighting in North Africa it was essential that the enemy should not know the size of our army, which he certainly overrated."



ANOTHER DAM: The new lock on the Main, the important river which unites the Western and South-Eastern industrial regions of Germany.



MORRISONS

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Aircraft Types and

D.H. MOTH MINOR

MANY different types and makes of aircraft originally designed for completely peaceful purposes have been found useful jobs to do during the present war. Patently almost any light aircraft intended for the use of flying clubs and owner-pilots is eminently suitable for duty as an elementary trainer, or light communication and liaison work, and a particularly attractive example in this category is the de Havilland Moth Minor.

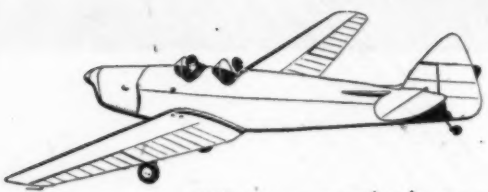
A result of collaboration between Capt. Geoffrey de Havilland and Major Frank Halford, the Moth Minor made its public appearance in 1939 after some two years' development work and, like its rather bigger relatives in the Moth family, it proved a thoroughly practical and likeable little machine, with good flying manners.

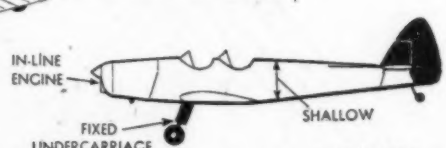
When war broke out, production on the Moth Minor ceased in this country, but it was continued in the de Havilland factory at Sydney, Australia, which at once began supplying it to the R.A.A.F. as an elementary trainer. Indeed, the simplicity of construction, easy maintenance and low operating cost which characterise the Moth Minor were found to be valuable attributes at a time when rapid expansion in training was called for. Actually there were two versions evolved, the open tandem two-seater which became the Australian trainer, and one with covered cockpits.

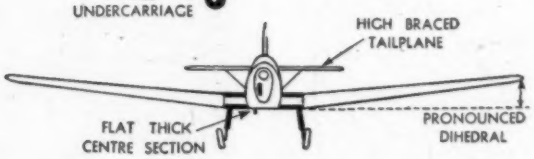
Probably the most interesting thing about the Moth Minor is its 90 h.p. inverted four-cylinder air-cooled in-line Gipsy Minor engine, because this was specially designed for it by Major Halford; it is, in effect, a smaller version of the more famous 130 h.p. Gipsy Major engine of the celebrated Tiger Moth trainer.

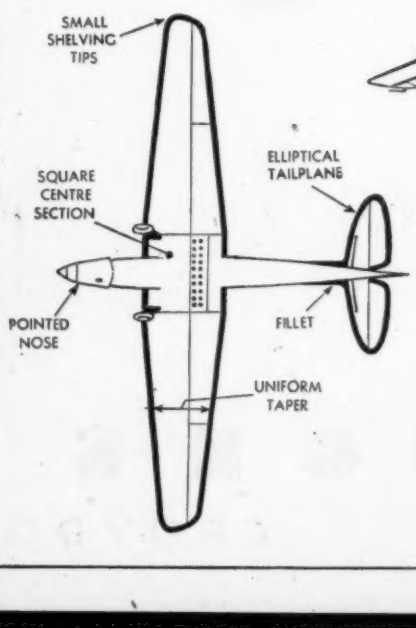
Wings and fuselage are of spruce with plywood covering, but the tail unit is fabric covered, the tailplane being strut-braced to the lower longerons. Incidentally, the wings fold backwards for easy stowage, and a perforated flap, which acts purely as an air-brake, is fitted beneath the centre section. Wheel brakes are also fitted.

Top speed is 118 m.p.h., and cruising speed a level 100 m.p.h. at 2,250 r.p.m., using 60 h.p. Service ceiling is 16,600ft. and cruising range 300 miles.









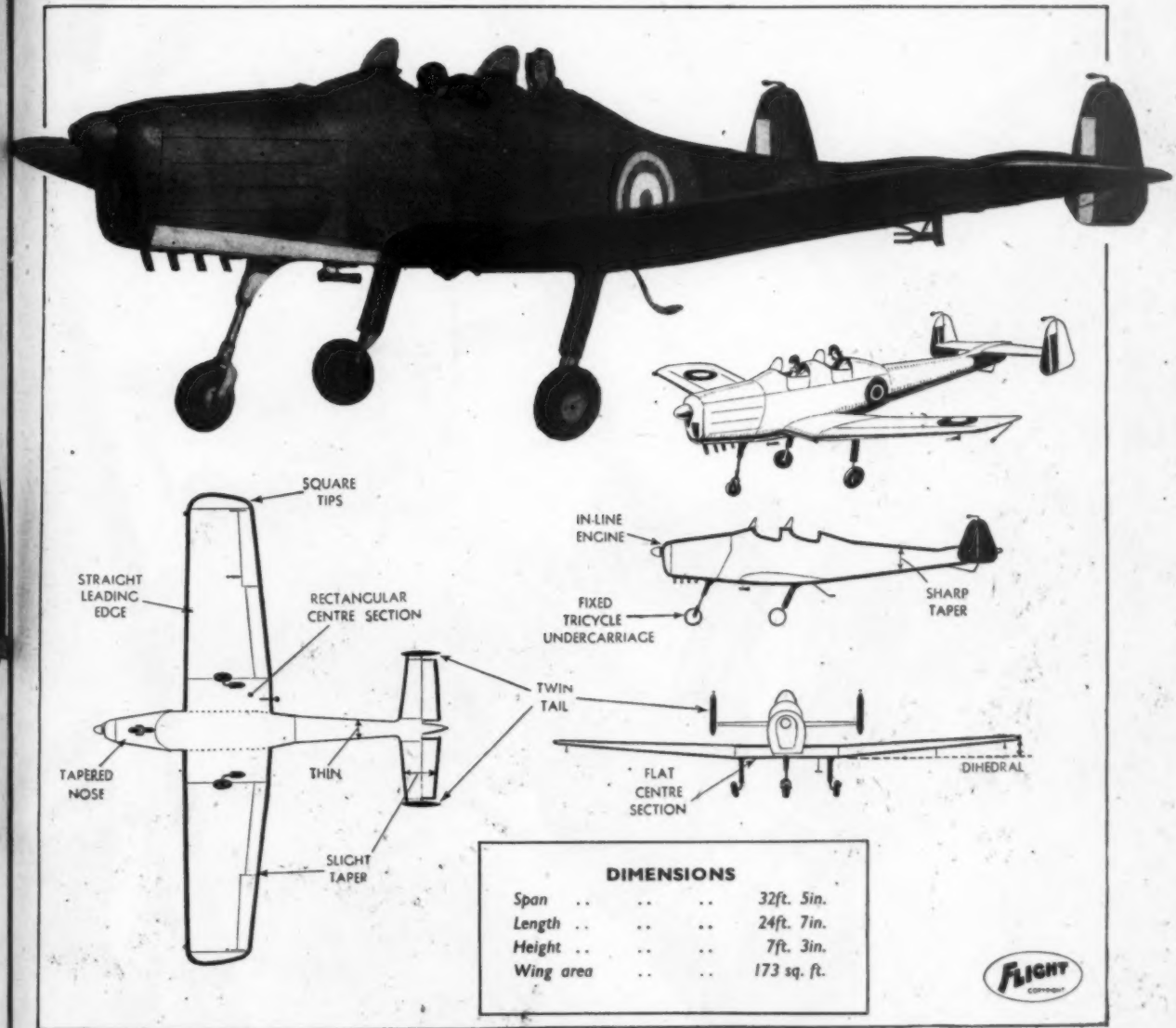
DIMENSIONS

Span	*36ft. 7in.*
Length	*24ft. 5in.*
Height	*6ft. 4in.*
Wing area	*162 sq. ft.*

FLIGHT

dheir Characteristics

G.A. OWLET



WITH the advent of the tricycle (or nose-wheel) undercarriage on a number of American military types which R.A.F. pilots might be called upon to fly, it was felt by General Aircraft that there was a place among elementary training types for a simple two-seater trainer having the tricycle undercarriage arrangement.

Nor did the production of a machine of this type present the makers with any new problems, for they had pioneered the tricycle undercarriage in this country several years before the war when they produced an experimental model of the Monospar S.T.25 so fitted, and after taking over the Cygnet light aircraft in 1938 they converted this to the tricycle arrangement.

The Owlet is, in fact, a development of the Cygnet and is of all-metal construction. The major change is the substitution of open tandem cockpits for the side-by-side seating, enclosed cabin of the Cygnet. But the rear portion of the fuselage, which is a monocoque boom attached by four bolts (and easily detachable for maintenance) is identical with that of the earlier civil type. The wings are covered in duralumin sheet and the twin tail-unit is also entirely of metal; in fact, only the detachable coaming of the forward component of the fuselage, which is of wood, provides an exception to the "all-metal" construction.

A 150 h.p. inverted 4-cylinder, in-line air-cooled Cirrus Major engine is fitted and this gives a top speed of 125 m.p.h., a cruising speed of 110 m.p.h., a service ceiling of 15,000ft., and a cruising range of 450 miles. Using the split trailing-edge flaps, the stalling speed is 53 m.p.h., but employing "tricycle technique" the Owlet may be landed at anything from 60 to 80 m.p.h.

This wide range of landing speeds, possible with a tricycle undercarriage since the nose wheel may be held down and the wings thus kept at negative incidence, is claimed by the machine's sponsors to make it particularly suitable for preliminary training in night flying as well as for initial instruction in tricycle technique. Indeed they claim that pupils can be taught *ab initio* by night.

AIRSPEED OXFORD

for advanced instruction in flying twin-engined aircraft

AIRSPEED (1934) LIMITED ENGLAND

Debate on Civil Aviation

All-day Discussion in the Commons : Designs for Civil Types to be Begun : Group Capt. Helmore Makes His Maiden Speech

"UNLESS in the next few weeks some energetic action is taken by the Government, we shall, most certainly, find an opportunity of dividing the House on the matter."

So said Group Capt. Wright, the hon. and gallant member for the Erdington division of Birmingham, during the course of his speech in the full-day debate in the Commons last week on civil aviation. And a few moments later he added, "The House must be grateful to the two members who opened the debate to-day. They kept their speeches very much to the main issues, and I hope the House will insist that when the Government spokesman replies he also keeps to the main issue. We cannot be satisfied by a few vague platitudes while energetically chasing the many red herrings which have been drawn across the path."

Whether the gallant group captain, and others, were indeed satisfied with the replies later given by Mr. Attlee, the Deputy Prime Minister and Dominions Secretary, and by Sir Archibald Sinclair, the Secretary of State for Air, was not disclosed in the 64 pages of Hansard occupied by the report on the debate, but it cannot be said that those replies told the House very much more than was revealed by Government speakers about a month ago when similarly urgent questions were put "in another place"—to use the delicate phrase by which each House always refers to the other.

Indeed, the speeches of Mr. Attlee and Sir Archibald were models of uninformative caution, with one notable exception.. Mr. Attlee did at least give the House one definite piece of information when he said, "It has been possible to allocate the different design jobs for some four types of planes to certain firms who may obtain assistance from other firms as to sections of the design work, so spreading the new work that it will not interfere with either the present or prospective war effort."

In short, he revealed officially for the first time that a definite move has been made by the Government towards getting out designs suitable for post-war civil airliners.

Differences of Opinion

There was, as might be expected, much disagreement over a number of matters concerning what Britain's future policy should be. In fact it may be said that about the only point on which there was complete agreement was that we must evolve a policy of some kind without delay since civil aviation would unquestionably prove a vital factor in the future well-being of the Nation, the Empire, and, indeed, the whole civilised world. That this fundamental truth is now universally accepted by both the Government and its sharpest critics was clearly proved by the fact that rather less time than usual was wasted by speakers labouring it; that the speeches as a whole contained fewer "blinding glimpses of the obvious" than have many previous speeches (in and out of Parliament) on civil aviation may well prove to be one reason why, to quote the hon. and gallant member for Erdington again, "historians will probably say that this debate was one of the most important that has ever taken place in this House, for the whole future of the British Commonwealth of Nations will depend upon the action which is taken by the Government as a result of it."

SHORT "G" CLASS : British 4-engined flying boat, three of which were built for transatlantic service. Span 134ft., top speed 214 m.p.h., luxury accommodation for 24 passengers. Cruising speed 185 m.p.h., range 3,200 miles.

LOCKHEED CONSTELLATION : American 4-engined transport prototype with pressure cabin and 35,000ft. ceiling. Estimated top speed 350 m.p.h., range about 4,000 miles. Net load 16 tons, seating accommodation 55.

Fear of Vested Interests

Points of disagreement and doubt were, as we have said, many. There was, for example, considerable concern from members of the Opposition lest post-war civil aviation should fall into the grasp of vested interests and be run with the primary object of lining pockets instead of providing the best possible service. Mr. Bowles (Nuneaton) was the first to raise this aspect of the case and said it was his first point that the aviation service should exist for the public and not the other way round. "It is clear to me from all the reports and the debates," he said, "that people are thinking in terms of vested interests which clearly implies profits."

Two equally important aspects which brought forth diversity of opinion were that of establishing an Empire policy and that of internationalism in aviation.

Mr. Perkins (Stroud), who opened the debate, asked that a round table conference of representatives of the Empire as a whole should be called immediately to London. It was common knowledge, he said, that talks had been going on for some time, but they had been of a vague nature, "carried on in a leisurely drowsy atmosphere with no sense of urgency."

"The only way in which we shall get decisions," he added, "is to get these representatives of the Empire here in London round a table, and then, I believe, in a comparatively short time, we shall get decisions taken, and, once the Empire is united, then, and only then, will be the time to discuss those things with our Allies, and in particular with the Americans."

The question of aviation's international aspect was raised by Mr. Tree (Harborough) who rose in support of Mr. Perkins. Saying that various Ministers got up from time to time and told them they were working very hard to bring about an aviation service second to none, and yet nothing seemed to happen, he thought that they were becoming "bogged down on the subject of internationalisation." He and his friends had found more misunderstanding and more differences of opinion on the question of the meaning of the word "internationalisation" than on anything else, and he hoped very much that when the Deputy Prime Minister spoke he would give them his own

DEBATE ON CIVIL AVIATION

interpretation of that word, and also say whether the Government were in any way committed on the matter. Later on, when Mr. Attlee intervened in the debate, Mr. Tree pressed for an answer to this question "in order to give some indication of whether the Government are pursuing that policy in their negotiations with the Dominions."

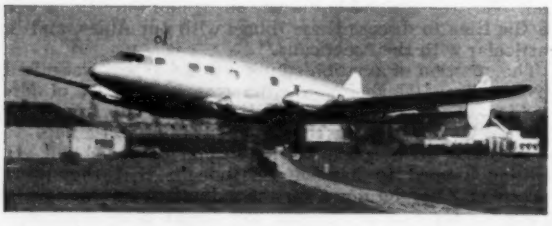
But the only reply he got from the Deputy Prime Minister was, "There are various methods by means of which this problem might be dealt with; among other matters some form of internationalisation may be considered." That Hansard should record "Laughter" at this point is not altogether surprising!

But there was no mincing of matters by Maj. Gen. Sir Frederick Sykes (Nottingham) when he touched upon the international aspect. "After the war," he said, there will inevitably be international rivalry for air transport. We must be realists in this matter. We have all believed for many years that the best that can be done for the world can only be effected by close collaboration between the United States and the British Empire, but we know also that practical and satisfactory collaboration can only be achieved with mutual understanding and the most careful thought by experienced men on both sides. After this war, as after the last war, every nation will immediately place its own interests first and international considerations second. We have got to face it. One of the difficulties will be to avoid competition with America."

Not Altogether Neglected

He did not agree with those who claimed that civil air transport had been altogether neglected during the war, and he mentioned that in 1942 B.O.A. aircraft had flown about 10,000,000 miles, but very much more than we had done must be done in the future. And for this we must have at the earliest possible moment a practical co-ordinated policy, internal, Imperial and international. We could not rely on converted bombers for our internal requirements, but we might use them as a stop-gap provided they were not allowed to carry on indefinitely into the peace, as had happened last time, to our undoing. Immense developments were in progress now and far greater ones were coming, and this was an aspect he wanted to urge very strongly. We should throw a great deal more weight than we had done into our research and design sections. We should search for some revolutionary practical and fundamental changes which would carry our aircraft construction not five or ten years ahead, but two or three decades ahead of anything in existence, and he stressed that the one or two chairs of aeronautics which we had at present were in no way adequate for the purpose.

"You cannot have too many trained brains at work to try and solve these problems and get rapidly improving forms of vehicles available for air transport in the future," added Sir Frederick, and said that one of the greatest mistakes made after the last war was that design and research were divorced from the civil department altogether. The Service side used all the available money. The R.A.F. was not interested in the broader aspects vital



DE HAVILLAND ALBATROSS: British 4-engined airliner to accommodate up to 30 passengers by day or 12 by night. Span 105ft. Cruising speed 200 m.p.h. at 15,000ft. Range 1,041 miles.

ARMSTRONG WHITWORTH ENSIGN: British 4-engined airliner, maximum accommodation 40 passengers. Span 123ft. Cruising speed 180 m.p.h. at 5,000ft. Normal range 1,370 miles.

to the progress of civil aviation which, for this and other reasons, accordingly languished.

Another point he stressed was that this island could and should be made the hub of a vast network of Imperial and international air traffic in the future. And to this end we must plan the very best air terminus possible and have it ready for peace. It was not always realised that although we had a vast and increasing number of airfields in this country, not 10 per cent. of them would be of the least value to us for peace purposes after the war.

Finally, Sir Frederick Sykes wanted to know if the Government favoured an international organisation, national State organisation, an Empire corporation, or what? They should make up their minds and publicly state their policy as soon as possible. Personally, he could not see Great Britain, or the Dominions, or Russia, or any other nation seriously considering the sort of internationalisation which meant international ownership, operation and control. The idea was quite fantastic, though there must be unrestricted right of flying over foreign countries and the international use of the air under agreed regulations, and the importance of coming to a friendly understanding with America in all these matters was, of course, obvious.

What was not quite so obvious, however, was the right method of approach to ensure this friendly understanding,

BOEING 307 STRATOLINER: American 4-engined commercial high-altitude transport. Pressure cabin for operation up to 20,000ft. Accommodation for 33 passengers by day or 25 by night. Span 107ft. Cruising speed 222 m.p.h. at 19,000ft. Cruising range on 50 per cent. power, 2,340 miles.

Mr. Tree, for example, claiming there was a widespread misunderstanding in this country of American psychology.

"It appears to be based," he said, "on the belief that the Americans are very sensitive people, and that, therefore, you must never tell them anything which might hurt their feelings, and as a consequence cause misunderstanding. In other words, we have a tendency to wrap up what we want to say in cotton-wool phrases. I assure hon. members that the effect of doing this is just the opposite to what is meant. It merely confuses and annoys and makes them very often think that we are trying to 'pull a fast one.'"

The debate was notable for something that drew words of great appreciation from several members who spoke afterwards, and that was the maiden speech of Grp. Capt. Helmore (Watford). Mr. Attlee, in fact, said he felt the debate would be memorable for this maiden speech, which gave him the impression of coming from a background of wide knowledge and deep thought. "I think that members wished," added the Deputy Prime Minister, "that he had gone on longer, which is not often the case in this House."

Not that Grp. Capt. Helmore's speech was particularly favourable towards the Government, for he recalled the short-sighted and unimaginative attitude towards the Schneider Trophy races in 1929 and 1931, which had resulted in the 1931 event being turned into what he called "a sort of charity flag day," and pointed out that but for the beneficence of Lady Houston that race would not have been flown. Yet it was no exaggeration to say that our technical supremacy in the Battle of Britain was founded on our victory in the Schneider race of 1931.

"My belief in the future of the air lies entirely in speed—and speed *per se*," he said. "The country that sticks to speed in the air gets predominence in the air. The aircraft without greater speed is only a little more dangerous and less decorous than a horse and cart."

In approaching our Empire and our Allies about the future of aviation we should include aviation in general

LIBERATOR C-87. American 4-engined transport version of B-24 bomber. Now on regular Atlantic war ferry service. Span 110ft. Useful load about 5 tons. Cruising speed about 245 m.p.h. and range 3,000 miles.

both for peace and war, and so avoid the mistake we made after the last war when we formed the League of Nations and gave it no striking power to implement its decisions. For this reason we must create jointly with our civil aviation control an air police force, capable of enforcing any decision made against aggressors, and thus ensure that wars will cease. We had already had the experience of the Germans making aircraft for war under the guise of civil aircraft, and if we did not control such matters in future we might yet begin the sowing of seeds for future wars. He therefore urged the Government, in their discussions with our Dominions and Allies, to bear in mind that the air, both for war and for peace, was indivisible, and that any discussions should be based on the fundamental principle that we must never have another war.

Grp. Capt. Helmore later referred to our "thousands of men and women whom we have turned into the finest technicians in the world," and to our pilots and aircrews who "will be pretty useful at making landings on the well-lighted flare paths of peacetime airports after their experience of lighting up the dark paths of Germany. We should not have to train many pilots for civil aviation, and we owed it to this great people and this great industry to see that their chosen element, the air, was open to them as a new world to conquer—'this element which they have made their own during the war.'"

Sir Robert Rankin (Kirkdale, Liverpool) raised a fresh point when he referred to the recent announcement made in Washington that a series of British and American conferences on post-war air transport were to be held in June or July, and he wanted to know if it had been stated who would be the British representatives. The Civil Aeronautics Board in America had opened a poll asking aircraft manufacturers and airlines for their views on American air policies, and he would like to know if there was any possibility of a similar poll being taken in this country and, if so, who would conduct it. But neither Mr. Attlee nor Sir Archibald Sinclair saw fit to include answers to these questions in their subsequent speeches.

BOEING 314: American Clipper 4-engined flying boat on transatlantic service. Accommodation, 68 day passengers or 36 sleeping. Span 152ft. Cruising speed 188 m.p.h. at 11,000ft. Cruising range with maximum load, 4,900 miles.

DE HAVILLAND FLAMINGO: British twin-engined transport. Accommodation 12 to 20 passengers, according to operational needs. Span 70ft. Cruising speed 200 m.p.h. at 10,000ft. Normal range 1,210 miles.

Touching the matter of an immediate Empire Council, Mrs. Tate (Frome) said: "I cannot help asking myself whether the Empire will be willing to confer in this country with those who are to-day in charge of British Overseas Airways Corporation," and added that she did not wish to make any personal attack.

When Mr. Attlee and Sir Archibald Sinclair eventually spoke on behalf of the Government, after a number of other members had added their quota in varying measure to the sum total of the debate (including Mr. Montague, the hon. member for West Islington, who said his constituents were not likely to become air-minded because the majority of them in ordinary times had to be wage-minded, rent-minded and even dole-minded, and therefore were not really interested in how quickly a few wealthy people could be flown from Britain to New York)—after all this and much more had been said, the Government speakers dwelt mostly on the subject of Empire policy, during which Mr. Attlee took exception to the suggestion that a conference with Dominion representatives should be summoned in London. It was not for us, he said, to summon and for others to obey, and a conference could only be arranged if it was the will of the Commonwealth. The Government had, he repeated, been in consultation with the Governments of the Dominions, seeking with them a solution to the problem which would best serve their common interests and the interests of the whole world.

No Details Yet

"We have asked the Dominions," said Mr. Attlee, "which is the best way, in their view, of making that personal contact which you must have, but I am not prepared to give any details because I have not received any yet. I do not think it is a useful thing to examine exactly what the methods would be, because I have not got the views of the Dominions yet on that point. There are various views."

Mr. Attlee finally ended with the following generality: "I cannot close without again emphasising that our policy is to develop civil aviation as a service to mankind. I believe it is vitally necessary for the economic and political security of the world that air transport shall be developed on the basis of international co-operation. There must be no return to the pre-war system of unbridled competition leading to political rivalry between the nations. Finally, never again must we have a system under which unscrupulous Powers can use the development of civil aviation as a cloak for military planning."

Sir Archibald Sinclair, in his turn, gave the House about the same amount of information on the Government's intentions, and spoke in favour of civil aviation remaining with the Air Ministry, which he described as "the repository of flying zeal and experience."

Birthday Honours

THE following members of the Empire Flying Services and aeronautical designers and scientists, etc., have been awarded honours on the occasion of the official celebration of His Majesty's birthday:—

BARON

Air Chief Marshal Sir Hugh Caswall Tremenheere DOWDING, A.O.C.-in-C., Fighter Command, 1936-40.

KNIGHTS BACHELOR

Capt. John Paul BLACK, Man. Dir., Standard Motor Co., Ltd., and Chmn., Joint Aero-engine Cttee.

George Paget THOMSON, Prof. of Physics, Imp. Coll. of Science and Technology.

COMPANION OF HONOUR

Ernest Walter HIVES, for services in design of aero-engines.

ORDER OF THE BATH

ROYAL NAVY

C.B. (Military Division)

Rear-Admiral D. W. Boyd.

ROYAL AIR FORCE

K.C.B. (Military Division)

Air Marshal Alfred Guy Roland Garrod.

Air Marshal Richard Hallam Peck.

Air Marshal Roy Maxwell Drummond.

Air Marshal John Cotesworth Slessor.

K.C.B. (Civil Division)

Nelson King Johnson, Dir., Meteorological Office.

C.B. (Military Division)

A.V-M. B. E. Baker; A.V-M. C. R. Carr; A.V-M. J. B. Cole-Hamilton; A.V-M. F. C. Cowtan; A.V-M. H. H. MacL. Fraser; A.V-M. A. Lees; A.V-M. C. W. Meredith, R.A.F.V.R.; A.V-M. R. D. Oxland; A.V-M. H. W. L. Saunders; A.V-M. V. H. Tait; A.V-M. H. E. P. Wigglesworth; A.V-M. H. S. Kerby; A.V-M. A. C. Collier.

Air Marshal R. H. Peck—K.C.B.

Air Chief Marshal Sir Hugh Dowding —Baron.

C.B.

E. F. Cliff, lately Prin. Estab. Officer, Air Min., now Treasury Estab. Rep. in Washington; W. S. Farren, Dir., R. Aircraft Estab., Min. of Aircraft Production.

ORDER OF THE BRITISH EMPIRE

C.B.E.

R. Chadwick, Chief Designer and Dir., A. V. Roe and Co., Ltd.; Prof. J. Jewkes, Dep. Dir.-Gen., Statistics and Programmes, Min. of Aircraft Production; Lt. Col. A. Erskine-Murray, Sec., Warwick T.A. and Air Force Asstn.; A. J. Palmer, Dir., Vickers-Armstrongs, Ltd.; R. K. Pierson, Chief Designer, Vickers-Armstrongs, Ltd. (Aircraft); B. N. Wallis, Asst. Chief Designer, Vickers-Armstrongs, Ltd.; Cclr. C. E. Worthington (Flt. Lt., R.A.F.V.R.), A.R.P. Controller, Leicester.

O.B.E. (Civil Division)

Capt. G. W. Bennett, Capt. of Aircraft, B.O. Airways Corpn.; Capt. R. W. Davies, Ch. Lands Officer, Air Min.; P. I. Dee, F.R.S., prin, scientific officer, Telecomms. Research Estab., Min. of Aircraft Prodcn.; Capt. E. E. Fresson, managing dir., Scottish Airways, Ltd.; S. B. Gates, prin. scientific officer, R. Aircraft Estab., Min. of Aircraft Prodcn.; A. Y. Smellie, asst. director of accounts, Air Min.; A. N. Spriggs, gen. works manager, Hawker Aircraft, Ltd.; C. F. Uwins, chief test pilot, Bristol Aeroplane Co.

M.B.E. (Civil Division)

A. F. Archer (Maj., H.G.), Civil Asst. and Accountant, Min. of Aircraft Prodcn.; Sqn. Ldr. N. G. Bennett, R.A.F.V.R., Sen. Inspr. of Accidents, Air Min.; Capt. F. T. Bright, Observer Cdr., R. Observer C.; E. I. Freemantle, tech. officer, Min. of Aircraft Prodcn.; H. W. Harper, works manager, A. V. Roe and Co., Ltd.; R. N. Holmes, radio officer, R.A.F. Ferry Command; A. J. T. Ireland, technical asst., Min. of Aircraft Producn.; E. G. Marchant, senr. staff officer, Air Min.; M. D. Morrissey, station manager, B.O. Airways Corpn.; A. J. Muir, tech. asst. II, Min. of Aircraft Prodcn.; T. E. Richardson, flying instructor, No. 4 Elementary Flying Training Sch., R.A.F. Flying Training Command; D. C. Robinson, asst. works supt., Handley Page, Ltd.; R. Stuart, chf. inspr., Bristol Aeroplane Co.; L. D. Tyrrell, ch. planning engineer, Rootes Securities, Ltd. (airframe factor).

IMPERIAL SERVICE ORDER

(Home Civil Service)

F. W. Filbee, asst. dir. of contracts, Min. of Aircraft Producn.; L. M. Jones, sen. executive officer, Air Min.

BRITISH EMPIRE MEDAL

United Kingdom (Civil Divisicn)

T. Beardsmore, office keeper, Min. of Aircraft Prodcn.; J. Berry, foreman fitter, Short Bros., Ltd.; C. G. Birch, civilian D.F. operator, Bomber Command, Air Min.; W. E. Bosher, foreman of trades, Maintenance Command, Air Min.; K. C. Brown, works supt., De Havilland Aircraft Co.; P. E. Crosson, shops supt., R. Aircraft Estab., Min. of Aircraft Prodcn.; G. S. Gant, civilian armament instructor, Grade I, Flying Training Command, Air Min.; T. F. Hole, engineer test supt., B.O. Airways Corpn.; C. W. Johnstone, prin. foreman, R. Aircraft Estab., Min. of Aircraft Prodcn.; A. Kerr, foreman, De Havilland Aircraft Co., Ltd.; E. F. B. Lea, duty controller, Royal Observer Corps; F. Leader, foreman, Hawker Aircraft Co., Ltd.; E. J. Marsh, prin, foreman, R. Aircraft Estab., Min. of Aircraft Prodcn.; C. H. Standen, meteorological asst., Grade III, Air Ministry Outstation; G. N. Sutherland, Observer, Royal Observer Corps; E. F. Vallis, civilian wireless operator mechanic, Army Co-operation Command, Air Min.; E. Winstone, aero engine mechanic, Bristol Aeroplane Co.

The list includes the names of 17 pilots and others in the service of either the R.A.F. Ferry Command or the British Overseas Airways Corporation who are commended for valuable service in the air.

Ernest Walter Hives—Companion of Honour.

BIRTHDAY HONOURS

DOMINION SERVICES LIST

ORDER OF THE BATH

C.B. (Military Division)

A.V-M. R. V. Goddard, C.A.S., R.N.Z.A.F.; A.V-M. G. Jones, R.A.A.F.

ORDER OF THE BRITISH EMPIRE

C.B.E. (Military Division)

Air Comdre. J. P. J. McCauley, R.A.A.F.

O.B.E.

Wing Cdr. H. T. Hammond, R.A.A.F.; Wing Cdr. M. Keogh, R.N.Z.A.F.

M.B.E.

Sqn. Ldr. J. G. Burns, R.A.A.F.; Flt. Lt. F. Gill, R.A.A.F.; F/O. J. J. McDowell, R.N.Z.A.F.; Flt. Lt. H. R. P. Relf, R.A.A.F.

AIR FORCE CROSS

Flt. Lt. J. H. Harper, R.A.A.F.; Sqn. Ldr. E. F. Harvie, R.N.Z.A.F.; Flt. Lt. L. S. Holman, R.A.F., on loan to R.A.A.F.; Sqn. Ldr. R. B. L. MacGregor, R.N.Z.A.F.; Sqn. Ldr. W. S. Maddocks, R.A.A.F.; Sqn. Ldr. O. J. O'Brien, R.A.F., on loan to R.N.Z.A.F.; Sqn. Ldr. M. H. Pearce, S. Rhodesia A.F.

BRITISH EMPIRE MEDAL

(Military Division)

Flt. Sgt. G. J. Goodsell, R.N.Z.A.F.; Sgt. C. M. Renner, R.N.Z.A.F.

COLONIAL OFFICE LIST

ORDER OF ST. MICHAEL AND ST. GEORGE

C.M.G.

W. J. Price, Dir., Public Works and Civil Aviation, Ceylon.

ORDER OF THE BRITISH EMPIRE

M.B.E. (Civil Division)

Mir Rashed Ahmed, Pilot Instr., Bihar Flying Club.

DISTINGUISHED SERVICE MEDAL

Devotion to Duty (Naval)

P/O. Air. Mech. (A) A. H. Gray, R.N.R.; L. Airman J. W. Green; Cpl. G. H. Burt, R.A.F.; Cpl. D. O'Sullivan, R.A.F.

ROYAL AIR FORCE

K.B.E. (Military Division)

Acting Air Marshal Francis John Linnell.

D.B.E. (Military Division)

Matron-in-Ch., Miss Emily Mathieson Blair, Princess Mary's R.A.F. Nursing Service.

C.B.E. (Military Division)

A.V-M. G. B. A. Baker; A.V-M. E. B. C. Betts; Air Comdre. T. E. Drowley; Air Comdre. W. H. Dunn; Air Comdre. T. W. Elmhirst; Air Comdre. H. A. Hewat; Air Comdre. C. W. Weedon; Air Comdre. D. C. T. Bennett, R.A.F.V.R.; Air Comdre. J. A. Boret; Air Comdre. W. A. B. Bowen-Buscarlet; Air Comdre. A. C. Citchley, R.A.F.V.R.; Air Comdre. J. A. Gray; Air Comdre. H. A. Haines; Air Comdre. R. Ivelaw-Chapman; Air Comdre. J. L. Kirby; Grp. Capt. C. H. Appleton; Grp. Capt. W. L. Dawson; Grp. Capt. E. H. Hooper; Grp. Capt. E. C. Hudleston; Grp. Capt. Sir Henry N. St. V. Norman, Bt., A.A.F.R. of O. (deceased) (appointment dated May 18th, 1943); Grp. Capt. D. MacFadyen; Grp. Capt. B. V. Reynolds; Grp. Capt. G. G. Barrett; Grp. Capt. G. A. Bolland, R.A.F.O.; Grp. Capt. R. B. Lees; Grp. Capt. W. K. Le May, A.A.F.; Grp. Capt. D. O. Mulholland, A.F.C.; Grp. Capt. G. N. E. Tindal-Carill-Worsley; Grp. Capt. M. W. S. Robinson; Grp. Capt. W. P. Wilson, R.A.F.V.R.; Grp. Capt. G. J. Powell, R.C.A.F.; Grp. Officer Selena F. Wynne-Eyton, W.A.A.F.

O.B.E. (Military Division)

Wing Cdr. G. Burges; Wing Cdr. A. A. Case; Wing Cdr. W. I. Grantham; Wing Cdr. G. D. Green; Grp. Capt. G. H. Foss; Wing Cdr. H. E. Hills, A.A.F.; Wing Cdr. L. A. Jackson; Wing Cdr. W. Kidd, R.A.F.V.R.; Wing Cdr. C. Lorimer; Wing Cdr. G. S. A. Parnaby; Grp. Capt. G. C. Pinkerton, A.A.F.; Wing Cdr. F. E. Rosier; Wing Cdr. R. B. Wardman; Wing Cdr. G. R. C. Baker; Wing Cdr. J. R. Bloxan, R.A.F.O.; Wing Cdr. B. Drewe, R.A.F.V.R.; Wing Cdr. G. H. L. Easterbrook, R.A.F.V.R.; Wing Cdr. W. R. Farnes, R.A.F.O.; Wing Cdr. R. Hiscox, A.A.F.; Wing Cdr. J. G. B. Hutchings, R.A.F.V.R.; Wing Cdr. A. Lee, R.A.F.V.R.; Wing Cdr. D. F. Massy, R.A.F.V.R.; Wing Cdr. G. P. S. Pollard, R.A.F.V.R.; Wing Cdr. A. G. Sutton; Wing Cdr. E. G. Wooberry; Hon. Wing Cdr. A. S. Fletcher, R.A.F.V.R.; Sqn. Ldr. H. Adams, A.A.F.; Sqn. Ldr. F. C. G. Badcock, R.A.F.V.R.; Sqn. Ldr. J. Salmon, R.A.F.V.R.; Sqn. Ldr. A. C. Snow; Sqn. Ldr. H. F. Bishop; Sqn. Ldr. R. D. George, R.A.F.V.R.; Sqn. Ldr. W. J. Grace; Sqn. Ldr. G. H. Harley, R.A.F.V.R.; Sqn. Ldr. A. W. D. How; Sqn. Ldr. A. N. Jarvis; Sqn. Ldr. N. W. Kearon; Sqn. Ldr. A. S. Linney, R.A.F.O.; Sqn. Ldr. G. W. S. Rice, R.A.F.V.R.; Sqn. Ldr. L. W. Wells, R.A.F.V.R.; Sqn. Ldr. C. G. O'Dea, R.A.A.F.

M.B.E. (Military Division)

Sqn. Ldr. C. Herrington; Sqn. Ldr. E. Lister, R.A.F.V.R.; Flt. Lt. J. Boyer; Flt. Lt. C. B. R. J. B. Curtis, R.A.F.V.R.; Sqn. Ldr. R. Darker; Flt. Lt. J. Duncan, R.A.F.V.R.; Flt. Lt. W. R. Dunlop; Sqn. Ldr. M. Golovine, R.A.F.V.R.; Flt. Lt. G. D. Graham, R.A.F.V.R.; Sqn. Ldr. M. L. Haigh, R.A.F.V.R.; Sqn. Ldr. W. Hore; Flt. Lt. A. K. Kibbler, R.A.F.V.R.; Flt. Lt. N. Livingstone, R.A.F.V.R.; Flt. Lt. G. V. Meredith; Flt. Lt. J. K. Milne; R.A.F.V.R.; Sqn. Ldr. A. R. Pearce; Flt. Lt. E. H. M. Samson, R.A.F.V.R.; Flt. Lt. C. H. Wallington; Flt. Lt. J. A. Williams; Flt. Lt. W. A. Ballett; Flt. Lt. A. W. Bennett, R.A.F.V.R.; Flt. Lt. F. L. Birch, R.A.F.V.R.; Flt. Lt. F. Bottoms; Flt. Lt. S. F. Browne; Flt. Lt. N. E. Browning, R.A.F.V.R.; Flt. Lt. C. W. Buckingham; Flt. Lt. F. N. S. Creek, R.A.F.V.R.; Flt. Lt. C. A. Freestone, R.A.F.V.R.; Flt. Lt. F. J. Gibney, R.A.F.V.R.; Flt. Lt. H. R. Hambleton, R.A.F.V.R.; Flt. Lt. D. N. Harris, R.A.F.V.R.; Flt. Lt. A. G. Lankester, R.A.F.V.R.; Flt. Lt. S. R. Walton; Flt. Lt. B. E. Wheadon, R.A.F.V.R.; Flt. Lt. J. K. Young, R.A.F.V.R.; F/O. F. H. Breach; F/O. J. Miles; F/O. E. J. H. Stanton, R.A.F.V.R.; P/O. F. J. R. Dodd, R.A.F.V.R.; P/O. L. R. Flower; P/O. R. W. Lamb; P/O. A. F. Murley, R.A.F.V.R.; P/O. J. S. W. Stewart, R.A.F.V.R.; W/O. H. P. Abbott; W/O. J. W. Beale; W/O. W. E. Draycott; W/O. C. F. Field; W/O. P. Fletcher; W/O. D. C. Kennedy; W/O. W. J. Leggett; W/O. W. J. A. Mayes; W/O. S. Morehen; W/O. W. P. Navin; W/O. H. Nickson; W/O. A. L. Pritchard; W/O. H. M. Smith; W/O. G. F. Staples; W/O. G. T. Willians; W/O. E. R. Luscombe; Flt. Lt. D. H. Gwinn, R.C.A.F.; Lt. B. Vorster, S.A.A.F.; F/O. Harjinder Singh Baines, I.A.F.; F/O. D. G. Bhore, I.A.F.; F/O. Margaret Cleator, W.A.A.F.; F/O. Catherine E. Clough, W.A.A.F.

BRITISH EMPIRE MEDAL (Military Division)

Royal Navy

Air Artif. Fourth Cl. G. C. N. White; P/O. Air Mech. (E) R. Thompson.

Royal Air Force

Flt. Sgt. J. F. Agutter; Flt. Sgt. H. Casey; Flt. Sgt. H. Cheers; Flt. Sgt. J. Clegg; Flt. Sgt. J. N. F. Edwards; Flt Sgt. R. A. Emerton; Flt. Sgt. R. Fox; Flt. Sgt. R. H. Hayes; Flt. Sgt. A. W. Lee; Flt. Sgt. I. Mackintosh; Flt. Sgt. C. R. C. Rutter; Flt. Sgt. C. G. Smith; Flt. Sgt. W. Springate; Flt. Sgt. A. Stephenson; Flt. Sgt. J. F. Turner; Flt. Sgt. D. L. Ward; Flt. Sgt. W. R. Warren; Flt. Sgt. A. Hale; Flt. Sgt. A. E. Morgan; Flt. Sgt. C. A. Sagar; Flt. Sgt. R. Sells; Flt. Sgt. W. C. G. Tracey, R.A.F.V.R.; Flt. Sgt. H. W. Thornett; Flt. Sgt. H. C. Ward; Sgt. P. M. Bannon, A.A.F.; Sgt. F. A. J. Carter; Sgt. W. T. Coombs; Sgt. J. F. Davies; Sgt. H. A. T. Harber; Sgt. F. S. Harding; Sgt. G. Hardy; Sgt. G. A. McLoughlin; Sgt. J. S. Pringle; Sgt. T. R. P. Roberts, A.A.F.; Sgt. T. Timperley; Sgt. E. Watson; Sgt. W. G. Lock; Sgt. V. A. E. Wicklow; Cpl. D. Bird; Cpl. H. Fraser; Cpl. J. L. Gutteridge; Cpl. J. H. Smith; Cpl. S. E. Stone; L.A/C. F. W. Flint; L.A/C. H. A. Garnham; L.A/C. K. Sunderland; L.A/C. T. E. Thompson; L.A/C. R. H. G. Triner; L.A/C. J. Turner; L.A/C. C. W. B. Young; A/C.1 J. C. Blackburn; Flt. Sgt. R. W. Raebel, R.A.A.F.; Flt. Sgt. W. G. Tomkins, R.C.A.F.; Cpl. A. S. Paterson, R.N.Z.A.F.; Sgt. Florence Celeste, W.A.A.F.

ROYAL AIR FORCE AWARDS

Bar to Air Force Cross

Grp. Capt. H. A. Purvis; Sqn. Ldr. T. A. Heath, R.A.F.V.R.; Sqn. Ldr. S. Wroath.

Air Force Cross

Wing Cdr. W. S. Gardner; Wing Cdr. G. Lowe; Wing Cdr. D. C. R. Macdonald; Wing Cdr. G. C. C. Bartlett, R.A.F.O.; Wing Cdr. E. C. Foreman; Wing Cdr. T. J. Gunn, R.A.F.O.; Wing Cdr. E. S. Smith, A.A.F.; Sqn. Ldr. J. R. Appleton; Sqn. Ldr. K. J. D. Dickson; Sqn. Ldr. P. Green, A.A.F.; Sqn. Ldr. F. C. Griffiths; Sqn. Ldr. R. L. Palmer; Sqn. Ldr. L. D. W. T. Withers, R.A.F.O.; Sqn. Ldr. E. L. Archer, R.A.F.V.R.; Sqn. Ldr. W. Brereton; Sqn. Ldr. E. F. J. O'Doire; Sqn. Ldr. L. M. O'Leary, R.A.F.O.; Sqn. Ldr. R. J. B. Pearse, R.A.F.V.R.; Sqn. Ldr. D. L. Pitt, R.A.F.V.R.; Sqn. Ldr. H. P. Powell, R.A.F.V.R.; Sqn. Ldr. L. F. Ratcliffe, R.A.F.V.R.; Sqn. Ldr. S. R. Thomas; Sqn. Ldr. D. W. Triptree; Sqn. Ldr. J. E. Watts; Flt. Lt. R. Kronfeld, R.A.F.V.R.; Flt. Lt. J. F. Marshall; Flt. Lt. R. W. McMillan, R.A.F.O.; Flt. Lt. J. R. Micklethwaite, R.A.F.V.R.; Flt. Lt. J. A. Newington, R.A.F.O.; Flt. Lt. J. Northrop; Flt. Lt. M. G. Olley, R.A.F.V.R.; Flt. Lt. A. Reece; Flt. Lt. J. L. Sharp; Flt. Lt. J. E. P. Thompson, R.A.F.V.R.; Flt. Lt. L. M. Whetham, R.A.F.V.R.

(A further list will be published next week.)

Post-war Transport Aircraft

Part II of Dr. Edward P. Warner's Wilbur Wright Memorial Lecture

(Continued from page 586)

IN Figs. 9 and 10 the data from Fig. 8 have been reworked. In the former, costs are plotted against speed for various assumed limiting design conditions. Curves are drawn for several wing loadings and for several values of the product of wing loading by take-off power loading, which is a rough criterion of take-off quality. As an aid to evaluating the significance of the latter group of curves, it is noted that the product for the DC-3, at the maximum take-off load allowed in regular transport operations in the United States, is 268; and that values of the product of 200, 300, 400 and 500 typically correspond, in the best present state of the art, to full-power take-off distances of about 1,200, 1,800, 2,400 and 3,100ft. respectively, to reach a 50ft. altitude from a standing start in still air.

On the assumptions that have entered into the preparation of these curves, there should be no appreciable economy from the adoption of a cruising speed of less than 200 m.p.h. unless the wing loading is to be limited to less than 35 lb. per sq. ft. Higher speeds than that are compatible with a close approximation to maximum economy only if the wing loading is to be increased with speed rapidly enough to keep it reasonably close (at least within 20 per cent.) to the value of $10(V/100)^2$, already suggested as constituting an approach to the optimum.

Economical Cruising at 200 m.p.h.

If the take-off quality be the criterion, the maximum economy for a given take-off performance appears to be secured at about 200 m.p.h., with an increase of cost per ton-mile of about 25 per cent. as a penalty on operating at a cruising speed of 250 m.p.h., and a 100 per cent. increase of cost when the cruising speed is raised to 300 m.p.h. A penalty of about a one-third increase in cost accompanies a reduction in take-off distance (to a 50ft. altitude) from 1,800 to 1,200ft.

In Fig. 10 the basic curves show the relationship between unit operating cost and the ratio of cruising power to wing area for various cruising speeds, thus eliminating weight as a direct factor. (In a bomber the rate of take-off power to area is typically about 4.0, and in fighters about 7.0.) If a cruising speed of 200 m.p.h. at 10,000ft. is a fundamental requirement, it appears that it would be obtained most economically by installing a take-off power of about 3.8 times the wing area; but that the full-power take-off distance under that condition would be about 3,000ft. to reach a 50ft. altitude. If the conditions of take-off are such as to limit the take-off distance to 1,800ft., take-off power and wing area should be readjusted to make the former only 1.9 times the latter. The operating cost per payload ton-mile would then exceed the theoretical minimum attainable cost by about 15 per cent. There is little economic benefit to be gained from designing for a full-power take-off distance of more than 2,400ft. to a 50ft. altitude.

If a cruising speed of 250 m.p.h. is desired, and is again subject to a take-off condition limiting the product of wing loading and power loading to 300, take-off power should be 4.9 times the wing area. To follow the same curve of take-off performance upward to its intersection with the curve that represents a cruising speed of 300 m.p.h. is to pass completely out of the realm of present reality, with a wing loading of 55 lb. per sq. ft. and a take-off power loading for the resultant transport that would closely approach the best that has so far been realised in a fighter.

A reduction of 33 per cent. in wing profile drag, accompanied by a saving of about 20 per cent. in residual parasite drag, would seem to be enough of a possibility within the next few years to justify serious consideration of its effects. Such a reduction would increase the cruising speed at 10,000ft. by from 10 to 15 per cent., the relative gain increasing with increase of power loading.

Cost of Carrying Cargo

The extensive use of aircraft for moving urgent military cargo during the war has aroused an immense interest in the possibilities of a similar use for commercial shipments.

From the previous discussion it appears that the minimum cost actually realisable in the present state of the art, with an aircraft carrying a payload of 12,000 lb., is about 20 cents per ton-mile for the moving of loads composed in major part of passengers.

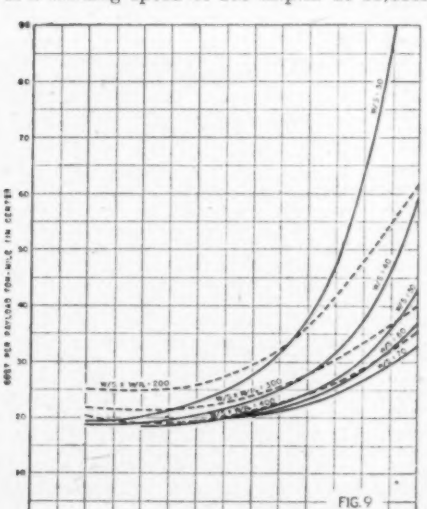


FIG. 9

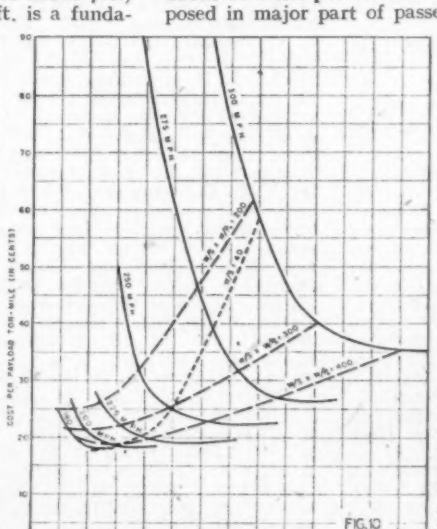


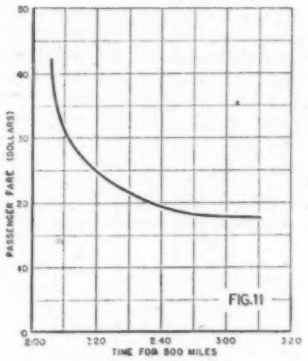
FIG. 10

The items of cost that could be eliminated if no passengers were carried and no commercial traffic of any kind had to be solicited amount at present to about 7.5 cents. per payload ton-mile. Upon the assumption that one-third of that amount would suffice to cover the cost of solicitation of freight traffic and the cost of loading freight and securing it in the airplane and handling it at the airports, the substitution of freight for passengers would allow a direct saving in cost of 5.0 cents per ton-mile. Superposing that saving on the reduction of unit cost due to the increase in the amount of payload carried, it appears that minimum operating costs per ton-mile can be reduced from the 18 cents that seem to represent the present limit with loads composed pri-

POST-WAR TRANSPORT AIRCRAFT

marily of passengers to about 10 cents in the case of unmixed freight.

If I apply to those figures my previously developed hope of a reduction of 15 per cent. in cost in the post-war period, beyond the best that can be done by merely choosing the best dimensions and design ratios for maximum economy in the present state of the art, I arrive at a possible post-war level of 2.5 cents per passenger-mile for passengers and 14 cents per ton-mile for goods.



Goods traffic by air has been and will be at its best in cases in which the discovery of new natural resources or the development of new industrial enterprises creates a new demand for transportation into areas where no railways or good highways or waterway routes exist and where it would be difficult and costly to create them. There are such cases in some of the British dominions and in other parts of the earth, and the enormous movement of freight by air in northern Canada is one of the examples that proves the opportunities that such developments offer to air transportation, and the benefits that air transportation confers upon the communities in return.

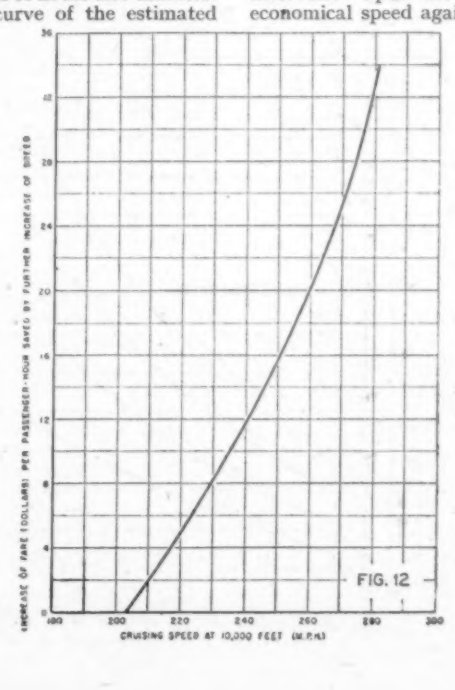
Tenpence per Ton-mile

If transportation of goods from airport to airport, exclusive of collection and delivery services, can actually be offered after the war at rates approximately 14 to 16 cents per ton-mile in the United States, or tenpence per ton-mile in Britain, I believe that the movement of goods, instead of being a minute fraction of the volume of passenger traffic, will become a very large element in air transport operation.

The patron of air transport does not purchase speed in terms of miles per hour, but in terms of hours and minutes. In Fig. 11 I have constructed a curve of the estimated rate of fare for a 500-mile trip against the total time consumed in making such a trip against a 30-mile wind, including normal allowances for taxi-ing, circling, climb, and descent. The curve is drawn to the assumptions that the product of wing loading and take-off power loading must not exceed 300, and that the wing loading must not exceed 45 lb. per square foot.

It is obvious that as the inter-city time is decreased, a mounting price has to be paid for each succeeding minute saved. In Fig. 12 the additional charge to the passenger per unit of time saved is plotted against speed. The form of that curve, and the values of its ordinates, are but little affected by the length of flight.

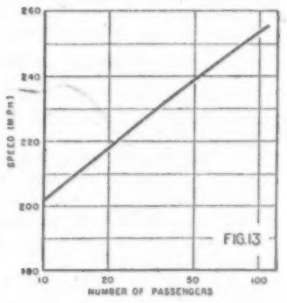
It appears that the charge that would have to be made for carrying a passenger over a 500-mile distance in two hours and seven minutes, to keep an airline self-supporting, would be more than twice as great as the charge for covering the same distance in three hours; and that the rate of fare for the three-hour journey would have to be increased by 30 per cent. for the first 33 minutes of time saved; a like amount for the next 12 minutes; and by as much more for the next six.



The curve in Fig. 12 indicates that the cruising speed at 10,000ft. could be pushed up to 235 m.p.h. before reaching the point where additional increments of speed would increase the cost to the passenger at a rate of more than $10.00 per hour saved.

From the charts that have been presented it is possible to construct an image of the aircraft from which it would be reasonable to expect this performance. It would be an airplane capable of carrying 40 passengers with their ordinary hand baggage and 4,000 lb. of mail and cargo. It would have a wing loading of approximately 34 lb. per sq. ft. and a take-off power loading of 9 lb. per horse-power. Its gross weight at take-off would be approximately 62,000 lb.; the wing area 1,900 sq. ft.; and the four engines would have a take-off rating of 1,700 h.p. each. The total operating costs should be about $1.45 per mile.

If the rather stringent take-off stipulation that underlay the plotting of Figs. 11 and 12 were relaxed, and the wing loading allowed to increase to 40 lb. per square foot, the same speed should be attained with the same payload in an airplane of about 55,000 lb. gross weight, with four 1,500 h.p. engines, and with the operating cost reduced to $1.35 per mile.



In Fig. 13 I have plotted the maximum speed compatible with reasonable economy, as just determined, against size of the aircraft in terms of passenger capacity, assuming that passengers will constitute two-thirds of the payload. The figure set at 235 m.p.h for a machine of about 40-passenger capacity would appear to drop to a maximum economical speed of only 215 m.p.h. for a 20-passenger aircraft and rise to 255 m.p.h. for one designed to carry 100 passengers.

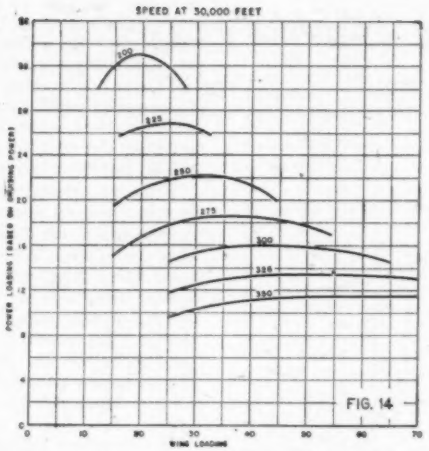
Fig. 13 revives the question of whether it is better to run small aircraft very frequently or large ones at longer intervals. Upon the hypotheses on which the curve of economical speed against size is drawn, the block-to-block time of a 100-passenger aircraft over a 500-mile distance ought to be some 20 minutes less than that of a 20-passenger machine.

There is, of course, a possibility of going still further. Upon the assumption that stability and control difficulties can be overcome in a true flying wing, and that the percentage of total structural weight in such a machine of very large size can be kept reasonably close to the figures characteristic of small transport aircraft, a 400,000-lb. airplane with a capacity of 350 passengers might be expected to have a maximum economically usable cruising speed at a height of 10,000ft., in flights of moderate length, of some 280-300 m.p.h. Such an aircraft might have unit costs 20 per cent. lower than those of a 40-passenger transport, and an inter-city time from 15 to 20 per cent. less than would be economically practicable with the 40-passenger aircraft.

The discussion up to this point has related only to operations at an altitude at which pasengers can be

safe and comfortable without oxygen or cabin-supercharging. Now the effect of raising the operating altitude has to be examined.

Certain of the inherent advantages of supercharged-cabin operations, in the elimination of passenger discomfort and in making it possible to go above a substantial proportion of the storm and icing conditions, are obvious. Supercharging also has the merit of making it possible to descend through the overcast at any desired rate, without having to consider the effect of rapid pressure change on the passengers, and it may thereby simplify the problems of traffic control. For some routes the supercharged cabin will not only be helpful but indispensable; but in considering whether it is a feature to be accepted only when necessity dictates, or one to be eagerly espoused in every instance, its effect on economy must be considered.



Weight of Pressure Cabin

For the purposes of the following studies I have assumed —perhaps rather optimistically—that within a short time after the end of the war commercially satisfactory power plants will be available to produce enough power for cruising and a reasonable rate of climb up to an altitude of 30,000ft. with a gear-driven blower. I have assumed that it will be possible to provide cabin supercharging for a total expenditure of weight in the cabin blowers, in the valves and controls, and in the fuselage structure of 3.5 per cent. of the gross weight of the aircraft, and that the increase of weight in the engines and airscrews for high-altitude operation will be 0.2 lb. per take-off horse-power. I believe that those figures represent reasonable probabilities.

Fig. 14, computed in the same fashion as Fig. 5 and upon the same assumptions in every respect except as to altitude, shows the cruising speed at 30,000ft. as a function of wing loading and power loading. The optimum wing loading if speed alone be considered is, of course, but little more than half the optimum for 10,000ft., and closely approximates $5(V/100)^2$.

In Fig. 15 the take-off horse-power required per pound of gross weight is plotted against cruising speed for the two altitudes, assuming that in every case the optimum wing loading will be used up to, but not in excess of, 50 lb. per square foot. A third curve gives the difference of the power-weight ratios, or the variation with speed of the amount of power per pound of gross weight that would be saved by flying at 30,000ft. instead of 10,000. The last curve shows the total effect of high-altitude operation on power-plant weight, allowing for a basic power-plant weight of 2.0 lb. per horse-power and for increase of weight for supercharging as previously assumed.

If only uniform operation at cruising speed had to be considered, the saving in power-plant weight by high-altitude operation should be sufficient to balance the additional weight of cabin supercharging provision at all speeds above 240 m.p.h. There are, however, certain additional factors to be taken into account.

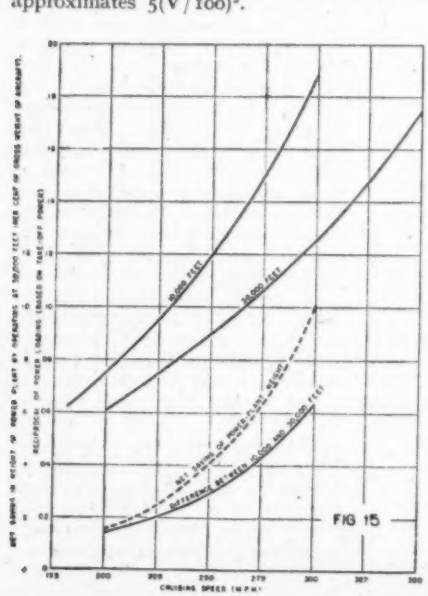
(a) Saving of fuel weight by high-altitude operation (assuming a uniform speed);

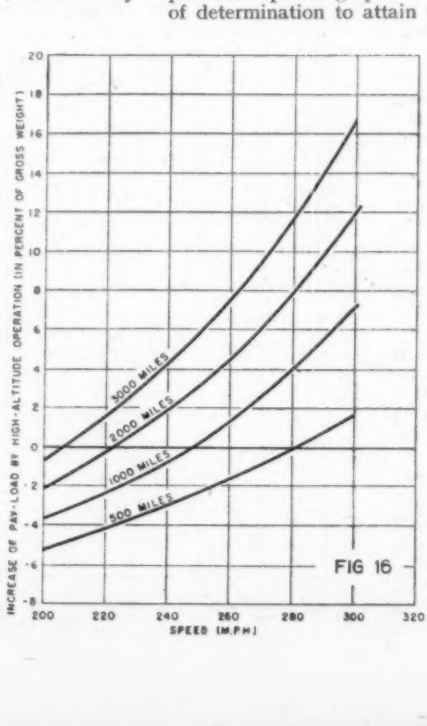
(b) Increase of structural weight due to lighter wing loadings for high altitudes;

(c) The effect on block-to-block speed of the time lost in climbing to high altitudes.

The first point is in favour of high-altitude operation; the second and third are against it.

It would appear that if a high degree of economy is desired in a transport operation supercharging will be used only when weather conditions along the route are such that high-altitude operation will contribute notably to safety and regularity of service. If, on the other hand, it is not a primary objective to keep costs close to the lowest possible level, the operating advantages and the luxury of supercharging can be secured at a total expense of cost per payload ton-mile of 10 or 15 per cent. in the range of most probable operating speed. In the still more extreme case of determination to attain very high speed at almost any cost, high-altitude operation is a part of the specification for keeping the expense of the speed to a minimum.





The difference between the payload in operating at 30,000ft. and that in operating at 10,000ft., plotted against speed for several lengths of flight. Proper allowance made for the effect of power loading and speed on fuel consumption.

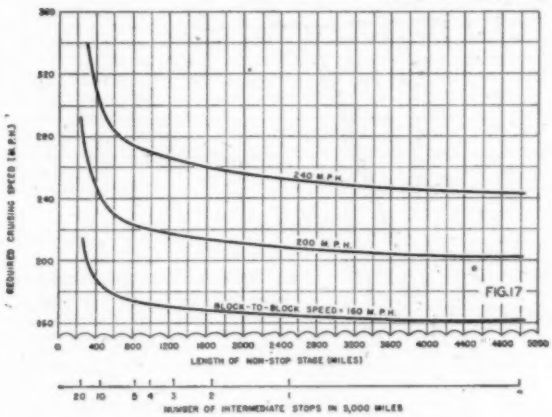
Long-range Flights

Non-stop flights of more than ordinary length fall into two categories. The non-stop distance may be imposed by the lack of possible intermediate fuelling facilities, particularly on over-water flights; or it may be freely chosen, in the interest of greater speed, economy, convenience, or passenger comfort.

The insertion of an intermediate stop not required for

TRANSPORT AIRCRAFT

traffic reasons involves loss of time and, in many cases, a sacrifice of regularity of operation. The loss of time in landing, refuelling, and taking-off and climbing back to cruising altitude is direct and reasonably predictable. The loss of regularity is less determinate. It depends upon weather conditions at the proposed intermediate points and upon the amount of progress that is to be made in continuing operations in spite of weather difficulties. One extreme instance is familiar to all of us. Under present conditions, transatlantic operations depending on Newfoundland as an intermediate stop would suffer many can-



cellations and delays which would be avoided in a non-stop operation between the United Kingdom and the United States or the Canadian mainland. The use of the Azores as a refuelling point for seaplanes presents similar difficulties, due in that instance to water conditions rather than to weather. There are, on the other hand, many cases in which the climatic conditions at the potential intermediate stops are good enough so that no appreciable proportion of cancellations need be feared as the result of their use. In those instances the decision can be based on considerations of overall speed, economy, and operating convenience.

Fig. 17 provides some of the data for a decision in such a case. For an assumed 5,000-mile flight in still air, and for block-to-block speeds of 160, 200 and 240 m.p.h. respectively, the cruising speed required to make good the desired overall speed is plotted against the length of the individual flight stage. Operation at an altitude of 10,000ft. is assumed, and the length of time actually spent on the ground at each stop is taken as varying from 10 minutes to refuel after a 500-mile flight, to 30 minutes for refuelling after one of 2,500 miles.

Effect of Stops

In Fig. 18 the study has been extended, for the particular case of a block-to-block speed of 200 m.p.h. over a 5,000-mile distance, to an analysis of the variation of payload with frequency of stops. The major factors controlling payload under these conditions are:—

(a) Increase of fuel load required as the length of stage is increased.

(b) Increase of power-plant weight and structural weight with increase of cruising speed, as required over the shorter distances to make good the desired block-to-block speed.

This analysis, like most of those that have preceded it, is based on a four-engined aircraft of about 60,000lb. gross weight and upon the best aerodynamic and structural characteristics that seem reasonably sure to be attainable in transport aircraft built immediately after the war.

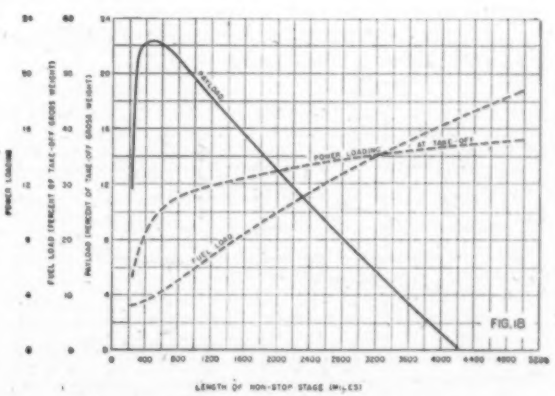
Specific fuel consumption is assumed at 0.42 lb. per h.p./hr. Take-off power is assumed to be governed by the two requirements that the average cruising power used throughout the flight must not exceed 50 per cent. of take-off power, and the cruising power in the initial stage, with the aircraft in its most heavily loaded condition, must not exceed 65 per cent. of take-off power. An aircraft which meets the latter requirement will normally have a rate of climb of at least 500ft. per minute on take-off power, and ability to accomplish the take-off should, therefore, present no problem. Some empty weight might be saved by using a higher take-off power loading, but it would be at the expense of having to increase the proportion of take-off power used in cruising to such an extent that a considerable increase in specific fuel consumption in the early portion of flight would result. The requirement as here set forth is roughly equivalent to a maximum limit of 32 for the products of take-off power loading and square root of the span loading at take-off. For an aspect ratio of 12, the product of the take-off power loading and the square root of the wing loading at take-off would be limited to 110.

Reserve Fuel

The fuel carried is computed on an assumption of flight against a 40-mile wind, together with an allowance for increase of distance due to detours or navigational errors or having to proceed to an alternate destination, of from 250 miles for the shortest distances to 500 for the longest, and an additional fixed reserve for approximately one hour of cruising operation. The combined effect of these several factors is to call for a fuel supply which exceeds the amount required to cover the designated non-stop distance at cruising speed in still air by a proportion ranging from 55 per cent. for a 5,000-mile distance, to 175 per cent. when the distance is 300 miles. Fig. 18 also includes a curve of fuel load and one of the power loading required at take-off in order that the specified block-to-block speed may be attained.

To allow for accommodation adequate for a long flight, whether it be made in a single stage or in several stages, the total weight of all those items which can be considered as directly proportional to passenger load has been taken to be equal to 50 per cent. of the payload. It is assumed that where intermediate stops are made, changes of crew will be possible; and the size of the operating crew carried in flight is, therefore, assumed to increase progressively with distance from a crew of three for non-stop distances of 720 miles or less to one of nine for a 5,000-mile flight.

Under these conditions the maximum payload at a given block-to-block speed would be carried by dividing the flight into stages of approximately 500-mile length. In view of the inconvenience of making any unnecessary stops and expense of maintaining the ground personnel at an increased number of points, the practically desirable distance between stops where economy is a factor of major importance would appear to range from 700 to 1,250 miles. For non-stop distances greater than 1,250 miles the economic penalty accumulates rapidly.



Payload for average block-to-block speed of 200 m.p.h. over 5,000 miles distance.

POST-WAR TRANSPORT AIRCRAFT

Larger payloads can be carried over long distances, and better economy thereby attained, if somewhat lower speeds are accepted. The most economical speed at an altitude of 10,000ft. is typically somewhat less than 30 times the square root of the wing loading; and unless wing loadings are to be increased to well outside the range of values that has heretofore been seriously considered in connection with air transport, the most economical mean speed during a long flight at moderate altitude is likely to remain below 180 m.p.h. While economical speed can be increased by increase of wing loading, it is at the expense of an increase in drag coefficient and, therefore, in fuel consumption.

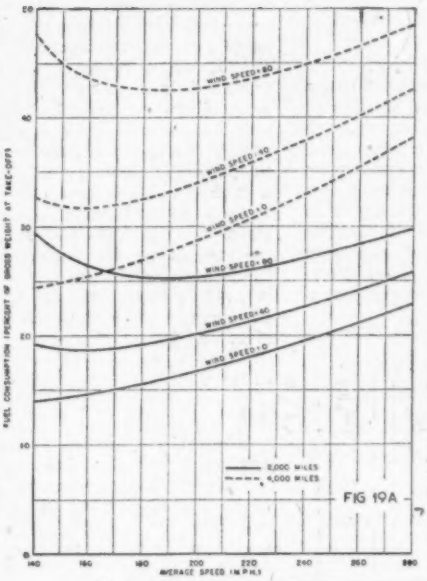
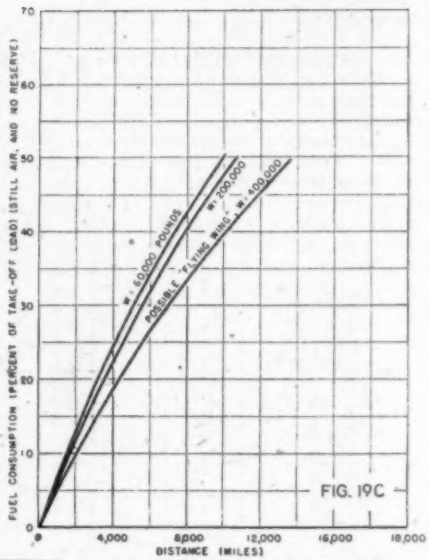


FIG 19A


W = 60,000 POUNDS
W = 200,000
W = 400,000
POSSIBLE FLYING WING
DISTANCE (MILES)
FUEL CONSUMPTION (PERCENT OF TAKE-OFF LOAD) (STILL AIR, AND NO RESERVE)
FIG. 19C

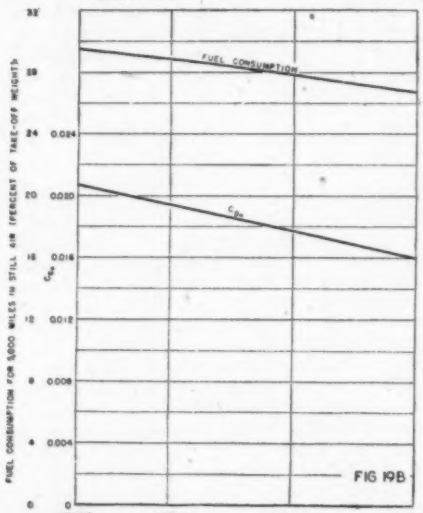


FIG 19B

Fuel Consumption

Fig. 19 shows the variation in fuel consumption with speed for three different wing loadings and two different distances, always upon the assumption of the best state of the designer's art that is immediately foreseeable. The values as plotted include customary reserves for deviations from course and consumption during climb, but assume that the worst predicted wind conditions will be that of still air. The wing loadings referred to in Fig. 19 are mean wing loadings during the course of the flight—the corresponding wing loading at take-off being higher, and that at landing lower.

In the next chart (Fig. 19A), curves are given for variation of consumption with speed over the same distances and for three different conditions, the wing loading at each speed being assumed to be that corresponding to minimum consumption.

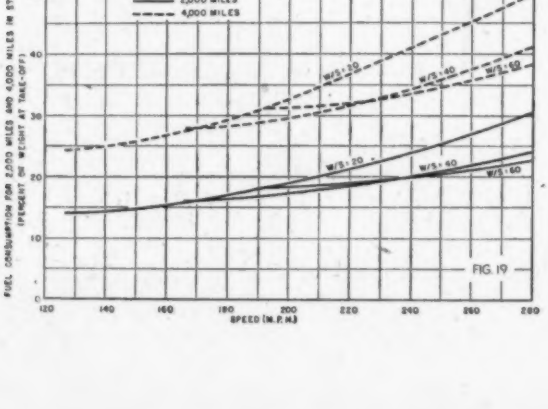


FIG. 19

Fig. 18 has indicated a maximum probable payload of 10 per cent. of the take-off gross load for a 60,000-lb. aircraft making a block-to-block speed of 200 m.p.h. in a 2,500-mile flight, on the assumption that the fuel load is such as to make it possible to complete the flight against a steady 40-mile wind. The reduction of block-to-block speed from 200 m.p.h. to 160, with the conditions otherwise unchanged, would reduce the fuel consumption by 2 per cent. of the take-off load; it should reduce the empty weight of the aircraft by about 2.5 per cent. of the take-off load, due principally to the higher power loading made possible by the reduced speed.

Aircraft Size

The factor of aircraft size remains to be considered. Two assumptions are common in present discussions of the future of very large aircraft. It is assumed that they will have notably lower drag coefficients than will be possible for aircraft of smaller size; and that, in order that the proportion of gross weight having to be devoted to structure may be restrained from increasing, they will require very high wing loadings. Unfortunately, these two prospects are in some degree contradictory, since the increase of wing loading increases the minimum D/L, and thereby offsets, at least in part, the inherent virtues of large size in reducing fuel consumption. I have not attempted any extended analysis of the variation of structural weight with size, on which experience with very large aircraft is so far limited and somewhat conflicting; but I have used the assumptions introduced in an earlier section of the lecture with regard to the variation with size of the drag of individual parts of the aircraft; I have superposed them on an assumed gradual increase of mean wing loading (average of loadings at take-off and at landing) from 40 lb. per sq. ft. in the 60,000-lb. aircraft to 60 lb. per sq. ft. at 400,000 lb.; and I have plotted in Fig. 19b the corresponding variation of drag coefficient and of fuel consumption in a 5,000-mile flight in still air (roughly equivalent to a 3,000-3,800-mile commercial operation, the

(*Continued at foot of next page.*)

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

BENDING BLADES

Nut and Bolt Analogy

READING in your May 20th edition of *Flight* D. H. Farley's letter on the subject of "Bending Blades," I was amazed that he should for one moment imagine that the airscrew blades should bend forward.

The airscrew of a plane does not simply push air backwards; it threads its way through the air with a certain percentage slip, due to the air not being a solid medium.

Let us imagine a bolt being threaded into an imperfect nut in which there is an obstruction. So far through the nut the bolt picks up with the obstruction and becomes jambed. If the bolt continues to be screwed into the nut, and the obstruction is immovable, the thread on the bolt will give way (providing, of course, sufficient force is used), and the direction of the "give" will obviously be backwards or in the reverse direction to the travel of the bolt. In a similar way a plane's airscrew pulling the plane behind it will, on impact with the ground at sufficient velocity, be bent in the reverse direction.

W. N. ELSON.

BLADES AND MANIFOLD PRESSURE

Why One Bends and the Other Builds Up

I HAVE read with interest letters appearing in your issue of May 20th under the headings "Bending Blades" and "Boost Pressure Variations," and I suggest the following explanations for the phenomena mentioned in these letters.

With regard to the bending back of airscrew tips: When the airscrew hits the ground its speed is greatly reduced, and since the speed of the aircraft is not proportionately reduced the airscrew ceases to give thrust, and instead has a braking effect, and if it continues to hit the ground will be bent backwards.

In the case of the normally aspirated engine referred to by another correspondent, the increase in manifold pressure which follows a coarsening of pitch is, I suggest, due to the slowing down of the engine without any alteration of throttle setting. When this takes place the effect of the inertia of the mixture is reduced, and there is more time for the pressure in the manifold to build up towards full atmospheric pressure.

D. M. RAMSAY.

Increasing the Load on Legs and Engines!

WITH reference to Mr. D. H. Farley's letter on the question of bending airscrew blades I would suggest that he missed the following point. Airscrew pitch and relative movement of air has no bearing on the subject; it being purely a case of aircraft movement relative to the ground, and as the airscrew is attached to the machine it will be bent back in exactly the same way as any other part, such as an undercarriage leg. To bend the blade forward by virtue of its screw action would require the aircraft to be stopped absolutely dead at the moment that the blade bit into the ground.

Alternatively, if your correspondent cannot accept this as the point on which his "reasoning" breaks down, we can fill our hair with straws and proceed as follows:

Let us suppose that the blades are pitched at 25 degrees and are 10in. in diameter. If airscrew speed is 2,000 r.p.m. we then have a theoretical forward speed of 325 m.p.h. approx. Allowing about 75 m.p.h. lost in slip and drag, we have an aircraft speed of 250 m.p.h. If, however, the airscrew be allowed to react against a more substantial medium than air, e.g., solid earth, there would be no slip and the blades would immediately attain the full forward speed of 325 m.p.h., but as the aircraft speed is only 250 m.p.h. the airscrew would either have to accelerate the aircraft to 325 m.p.h. or bend forward. This would only occur if we lightly ignore a number of unpleasant possibilities, such as shearing, bending chordwise or not bending at all. From the foregoing it would seem that one of four things happen: (1) The blades bend backward; (2) 1 is a mirage, and the bending is in fact forward; (3) they do not bend at all; (4) something else happens.

Incidentally, whose leg do you think is being pulled?

To turn to a decidedly saner letter, Mr. J. Ward states that on changing the pitch of an airscrew driven by an unblown Gipsy engine the manifold pressure rises to 12 lb./sq in. absolute. This is, of course, only natural, as in any engine the manifold pressure must rise if constant r.p.m. are maintained coupled with an increase in load (such as driving a coarse-pitch airscrew as opposed to one of fine pitch). This increase in manifold pressure will in turn affect the boost gauge of a blown engine owing to the control capsule being subject to manifold pressure.

P. R. BROWN.

WHITHER THE FLYING MACHINE?

R.A.F. Riggers are Proud of Their Work

IN your publication of *Flight* of May 20th I read an article, "Whither the Flying Machine?" by "Indicator." It is very apparent that "Indicator" is what is commonly called "blowing the gaff" towards the end of his article.

I myself am a rigger charge-hand trained by the Government in their hour of need in the early part of the war, and before then I must confess I knew nothing about aircraft. Does "Indicator" think that the Government would allow fools to play around with such expensive things as aircraft, particularly where airmen's lives are at stake?

On behalf of all the Government-trained riggers (and, believe me, there are some thousands of us) let me tell "Indicator" that when it comes to a job of rigging or trimming an aircraft we are the boys who can do it, books or no books, and we are proud of our work, too—as proud as the men who design them.

I keep a record of all the machines that pass through my hands, and you may be sure I have a long list of them, and heavy bombers as well as fighters need very accurate trimming after they have been equipped.

J. HOWARD (Rigger C./H.).

POST-WAR TRANSPORT AIRCRAFT — Continued

exact figure of equivalence depending upon prevailing winds, availability of emergency landing places short of the assigned destination, and other factors).

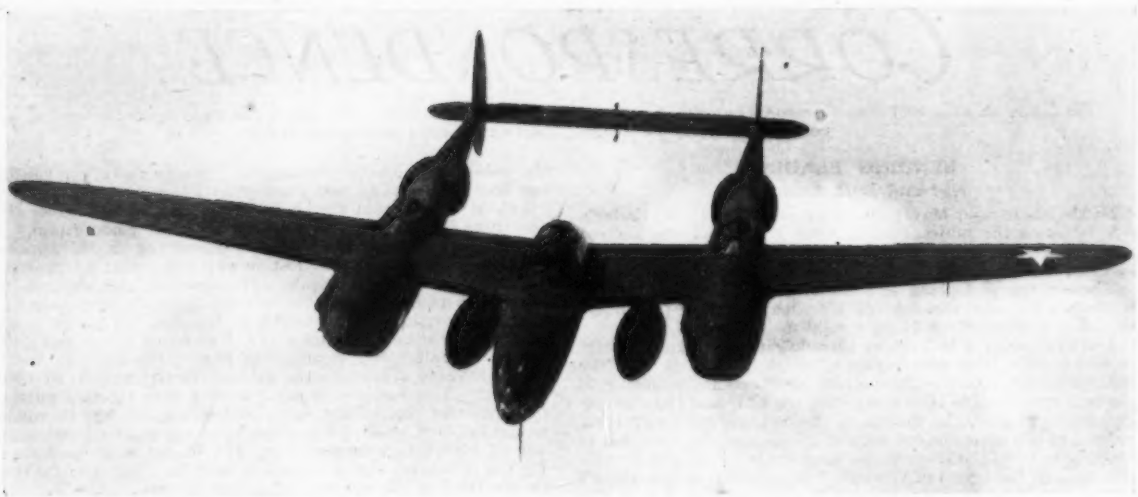
On the particular assumptions adopted here, the decrease of relative fuel consumption with increase of size is disappointingly slow. An increase of gross weight from 60,000 lb. to 200,000 lb., for example, would decrease the relative consumption over a 5,000-mile distance in still air by only about 1.7 per cent. of the initial gross weight.

The optimum distance between refuelling stops, in cases where the operator has some freedom of decision in that respect, tends to increase with increase of size of the aircraft. I have concluded that the best practical distance between refuelling stops, in cases where their location is not controlled by considerations of traffic and where a given block-to-block speed is required to be maintained over the total length of the route, would be from 700 to 1,200 miles for a 60,000-lb. aircraft. For a machine of 200,000-lb. weight those distances might be increased, by from a third to a half.

As a final look into possible future development on this point, I have returned to the true flying wing of 400,000 lb. weight. For such a machine the fuel consumption in a long flight ought to be about 15 per cent. lower than in the conventional aircraft of the same weight as plotted in Fig. 19B.

In Fig. 19C fuel consumption, again as a fraction of gross weight at take-off, is plotted against length of flight for the three cases of the 60,000-lb. aircraft that seems realisable in the very near future; of the 200,000-lb. aircraft similarly realisable; and of the hypothetical flying wing of 400,000 lb. gross weight. These curves represent cruising consumption only, with no allowance for headwinds, no reserves, and no allowance for power used in take-off and climb.

(To be concluded next week.)



TWO OF EVERYTHING : The twin-engined twin-boom twin-tail Lightning now has twin supplementary fuel tanks. Each tank weighs 90 lb. empty and holds 150 U.S. gallons of petrol. When empty they can be dropped. Top speed is lowered by four per cent.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

Retirement

GENERAL DUTIES BRANCH.

Group Capt. (temp. Air Comdre.) J. L. VACHELL, M.C., is placed on the retired list on account of ill-health and retains rank of Air Comdre. May 21st, 1943.

Awards

THE KING has been graciously pleased to approve the following awards which have been made in recognition of gallantry displayed in flying operations against the enemy :—

Distinguished Service Order

Wing Cdr. J. M. THOMPSON, D.F.C.—This officer fought in France and later took part in the Battle of Britain. For the past nine months he has been engaged in flying operations from Malta, playing a prominent part in the defence of the island during a period of intense air attacks. Latterly Wing Cdr. Thompson has led formations of fighter bombers in numerous successful attacks against port installations, factories, airfields and other targets.

Lt. Col. D. 'H. LOFTUS, D.F.C., S.A.A.F.—This officer has completed much operational flying, having fought in Abyssinia and in the earlier campaign in the Western Desert. Since the fighting at El Alamein, Lt. Col. Loftus has taken part in thirty-five sorties. By his personal example he has imbued a fine fighting spirit throughout the wing, which has been responsible for many destructive attacks on the enemy's ground forces. Lt. Col. Loftus has destroyed three enemy aircraft.

Act. Sqn. Ldr. J. R. URWIN-MANN, D.F.C., No. 126 Sqn.—Within the past six months whilst operating from Malta this officer has completed a large number of sorties, involving attacks on factories, warehouses, port installations, power stations and airfields in Sicily and nearby enemy islands. On one occasion he led a formation which attacked an airfield and destroyed many aircraft on the ground. Sqn. Ldr. Urwin-Mann also obtained a hit on a petrol installation, causing a violent explosion and a large fire. Another of his successes was the destruction of a portion of the main railway line during a sortie at Gela in January, 1943. During the same operations, Sqn. Ldr. Urwin-Mann engaged an Me 210, shooting away its starboard engine.

P/O. R. J. HOPKINS, R.A.F.V.R., No. 466 (R.A.A.F.) Sqn.—In April, 1943, P/O. Hopkins, F/O. Clayton and Sgts. Hicks and Blair were air bomber, navigator, captain and wireless operator respectively of an aircraft detailed to attack a target in the Ruhr. Over Germany the aircraft was attacked by an enemy fighter. The first burst of fire from the attacker fatally injured the rear gunner and wounded the air bomber, navigator and wireless operator. The fighter made a second attack but Sgt. Hicks avoided its gunfire by turning steeply under the enemy aircraft which was not seen again. Although the hydraulic and brake systems of the bomber were damaged, causing the wheels to drop down and the bomb doors to open, the crew decided to continue their mission. P/O. Hopkins, the air bomber, although suffering from a compound fracture of the arm and, at times, only retaining consciousness with great difficulty, displayed unsurpassed determination by directing his pilot to the target and bombing it successfully. On the return flight, P/O. Hopkins, F/O. Clayton and Sgt. Blair laboured for more than two hours to assist the mortally wounded rear gunner, extricating him from his turret and administering morphia; some of their efforts were made whilst flying at 15,000 feet and without oxygen. Sgt. Hicks eventually flew the damaged aircraft to an airfield in this country, where he effected a landing without the aid of flaps.

Act. Wing Cdr. A. H. SMYTHE, D.F.C., A.F.C., R.A.F.O., No. 214 Sqn.—Wing Cdr. Smythe has commanded the squadron since July, 1942. Since his last award he has completed numerous operational sorties, invariably choosing missions against the most difficult and heavily defended targets. Over such targets as Cologne, Lorient and Stuttgart he has displayed fine courage and resolution.

Sqn. Ldr. D. W. DONALDSON, D.F.C., R.A.F.V.R., No. 156 Sqn.—Since the award of the D.F.C., this officer has completed numerous operational sorties, most of which have been against heavily defended targets in Germany and Italy. He has provided an outstanding example of determination and devotion to duty.

Act. Sqn. Ldr. J. K. M. COOKE, D.F.C., No. 83 Sqn.—Since the award of the D.F.C. this officer has completed numerous operational sorties, many of them to distant and heavily defended targets such as Berlin, Turin and Nuremberg. He has set a high standard of efficiency, both on the ground and in the air.

Act. Sqn. Ldr. J. N. FORREST, D.F.C., R.A.F.V.R., No. 83 Sqn.—Since the award of the D.F.C. in May, 1941, this officer has completed numerous sorties. On one occasion, whilst over the objective, the bomb compartment and its contents caught fire. Although his aircraft was, as a consequence, most accurately engaged by the ground defences, the sortie was successfully completed.

Act. Sqn. Ldr. J. HURRY, D.F.C., No. 83 Sqn.—Sqn. Ldr. Hurry was awarded the D.F.C. in September, 1941, and has since completed numerous operational sorties, many of them against dangerous and difficult targets. On one occasion, while over Turin, the bomb compartment of his aircraft burst into flames. The fire made the aircraft an easy visual target for the anti-aircraft gunners. Despite these harassing circumstances, Sqn. Ldr. Hurry persisted in his mission and pressed home his attack with the utmost determination, thereby contributing much to the success of the entire operation. Afterwards he flew his aircraft safely to base.

Act. Flt. Lt. R. F. NODEN, D.F.M., R.A.F.V.R., No. 12 Sqn.—Since the award of the D.F.M. in July, 1941, Flt. Lt. Noden has completed a number of sorties over enemy territory. These have included flights to Essen, Cologne, Turin and Munich, and also two to Berlin, where intense anti-aircraft fire and fighter opposition was encountered. Flt. Lt. Noden is now on his third tour of duty. He has operated successfully from this country and in the Middle East.

Flt. Lt. K. F. THIELE, D.F.C., R.N.Z.A.F., No. 467 (R.A.A.F.) Sqn.—The majority of this officer's sorties have been attacks on well-defended and distant targets which have all been highly successful. On one occasion during an attack on Berlin his rear gunner lost consciousness from lack of oxygen, but Flt. Lt. Thiele proceeded with the mission although two of the crew were fully occupied with the unconscious man. Later he returned to this country at a very low altitude in an attempt to succour the gunner. While on a flight to Nuremberg in March, 1943, the port engine caught fire early on the outward journey. The flames were extinguished, however, and the whole flight accomplished with success.

Bar to Distinguished Flying Cross

Act. Sqn. Ldr. G. W. CURRY, D.F.C., R.A.F.V.R., No. 57 Sqn.—Since being awarded the D.F.C. Sqn. Ldr. Curry has taken part in numerous sorties. On February 1st, 1943, he became deputy flight commander, in which capacity he has been of the greatest assistance to his squadron commander. Sqn. Ldr. Curry, who participated in the daylight raid on Milan and two raids on Berlin, has always pressed home his attacks with the greatest determination and courage.

Distinguished Flying Cross

F/O. R. F. CLAYTON, R.A.F.V.R., No. 466 (R.A.A.F.) Sqn.—For citation see P/O. Hopkins, D.S.O.

Act. Flt. Lt. T. S. LEA, R.A.F.V.R., No. 77 Sqn. (since missing).—One night in April, 1943, this officer captained an aircraft detailed to attack Frankfurt. Whilst still many miles from the target, on the outward flight one of the engines in the aircraft became unserviceable. In spite of this, Flt. Lt. Lea continued to the target and pressed home his attack. Whilst over the target area the bomber was hit in the wings, fuselage and astro-dome by anti-aircraft fire. Displaying great skill, Flt. Lt. Lea flew the damaged bomber back to this country.

P/O. G. W. WOODWARD, R.A.F.V.R., No. 51 Sqn.—One night in April, 1943, this officer was the captain of a bomber detailed to attack Stettin. On the outward flight, whilst still a considerable distance from the target, one of the engines failed. Despite this, P/O. Woodward continued his flight to the target which he ultimately bombed successfully. Displaying superb airmanship he flew the bomber to base on three engines and effected a perfect landing.

Sqn. Ldr. G. S. FRY, No. 9 Sqn.—This officer has, on many occasions, brought back successful photographs of the targets, which have included the most heavily defended objectives in Germany. In the daylight raids on Le Creusot and Milan he commanded his flight in a most commendable manner.

Sqn. Ldr. K. J. MCDONALD, No. 78 Sqn.—This officer has completed 28 operational sorties, a number of which have been against strongly defended enemy objectives. Recently during an attack on Essen his aircraft was heavily engaged

by the defences during the bombing run and sustained severe damage. During this and all other sorties, Sqn. Ldr. McDonald has always displayed the greatest coolness and courage.

Act. Sqn. Ldr. C. F. ANDREW, R.A.F.V.R., No. 35 Sqn.—During many sorties against the enemy's most heavily defended targets, Sqn. Ldr. Andrew has shown sterling qualities in defending his aircraft.

Act. Sqn. Ldr. P. L. CHILTON, A.F.C., No. 115 Sqn.—This officer is now serving on his second tour of operational duties. His sorties have included many attacks against the enemy's most heavily defended targets.

Act. Sqn. Ldr. D. A. CRACKNELL, R.A.F.V.R., No. 49 Sqn.—Since completing his first tour of operational duties, this officer has participated in a number of sorties. While in the Middle East he completed a number of attacks on Greek and Italian objectives. On more than one occasion engine trouble has failed to prevent him from completing his mission, and once when attacking Turin one engine failed before he had crossed the Alps. In spite of this he continued, bombed the target, and flew the aircraft safely to base.

Act. Sqn. Ldr. C. M. EVERSON, R.A.F.V.R., No. 156 Sqn.—Sqn. Ldr. Everson has taken part in numerous operational sorties with keenness and courage, in spite of being involved in a serious flying accident early in his operational career.

Act. Sqn. Ldr. E. P. M. FERNBANK, No. 192 Sqn. —Since September, 1939, this officer has been continuously engaged in flying duties, and has completed 1,194 hours in the air since that date. He has invariably displayed exceptional courage, determination and devotion to duty.

Act. Sqn. Ldr. J. A. INGHAM, R.A.F.V.R., No. 44 Sqn.—This officer has always been outstandingly efficient, both as a flight commander and a pilot. His keenness, courage and determination to complete his mission regardless of adverse weather or enemy opposition have been worthy of the highest praise.

Act. Sqn. Ldr. I. R. C. MACPHERSON, No. 196 Sqn.—This officer, who has taken part in many operational sorties, has displayed extreme coolness and courage in the face of danger. His keenness and determination during attacks on such targets as Cologne, Hamburg and Kiel, where very heavy opposition is encountered, have been a source of inspiration to his Flight.

Act. Sqn. Ldr. F. M. OSBORN, No. 44 Sqn.—This officer has invariably displayed the greatest keenness and enthusiasm to complete his allotted duties. Throughout all his operational missions, which have included raids on Milan and Le Creusot, and attacks on many other heavily defended targets, he has displayed exceptional determination to reach and attack the objective.

Act. Sqn. Ldr. F. W. PARKER, R.C.A.F., No. 426 (R.C.A.F.) Sqn.—Sqn. Ldr. Parker has taken part in successful attacks against many varied and heavily defended targets in Germany, including Hamburg, Essen, Cologne and Kiel.

Act. Sqn. Ldr. G. T. PEARSON, R.C.A.F., No. 35 Sqn.—Sqn. Ldr. Pearson is a highly efficient member of aircraft crew. He has completed many operational missions against the most heavily defended targets, and has achieved outstanding success.

Act. Sqn. Ldr. G. A. ROY, R.C.A.F., No. 425 (R.C.A.F.) Sqn.—Sqn. Ldr. Roy is an outstanding captain of aircraft. He has taken part in many raids on heavily defended targets, such as Bremen, Essen and Cologne, and, on every occasion, has pressed home his attack with good effect. When detailed for special reconnaissance work he has invariably produced accurate and thoroughly reliable reports.

Act. Sqn. Ldr. E. F. SLY, A.F.M., No. 218 Sqn.—In November, 1942, while on operations against Stuttgart, one engine of this officer's aircraft became unserviceable while over the target area. Despite this, he pressed home his attack in a daring manner, and returned safely to base. On another occasion, while minelaying, Sqn. Ldr. Sly was forced to bring his aircraft down to 300ft. owing to damage sustained in combat with an enemy fighter. By superb airmanship and determination a safe return was made.

Act. Sqn. Ldr K. S. STAMMERS, D.F.M., R.A.F.V.R., No. 12 Sqn.—Since being awarded the D.F.M. in July, 1941, this officer has completed numerous sorties. He has participated in attacks against such heavily defended targets as Milan, Munich, Wilhelmshaven, Essen, Berlin, Cologne and Hamburg, where he encountered fighter opposition.

Act. Sqn. Ldr. W. SUBTEES, No. 77 Sqn.—This officer, on his second tour of operational duty, has a fine record of courage and determination. Throughout the whole period he has shown an unselfish devotion to duty.

Act. Sqn. Ldr. D. H. VILLIERS, R.A.F.V.R., No. 12 Sqn.—The numerous operational sorties completed by this officer include attacks on Berlin, Turin, Milan and Essen. On all of these intense anti-aircraft and fighter opposition was encountered.

Flt. Lt. R. W. J. HOOPER, R.A.F.V.R., No. 158 Sqn.—One night in March, 1943, Flt. Lt. Hooper was captain of an aircraft detailed for an operational mission. On the outward flight, while crossing the enemy coast, anti-aircraft fire was encountered and severe damage sustained, which considerably affected the speed and handling of the aircraft. Undeterred by this, Flt. Lt. Hooper continued to his target, accomplished his mission, and finally flew the aircraft safely to base.

Act. Flt. Lt. F. K. BAINBRIDGE, R.A.F.V.R., No. 77 Sqn.—Flt. Lt. Bainbridge has taken part in many operational sorties to targets in enemy and enemy-occupied territory and also in an anti-submarine patrol.

Act. Flt. Lt. R. N. G. BARLOW, R.A.A.F., No. 61 Sqn.—This officer has participated in attacks on Essen, Berlin, Hamburg and Cologne, and on two occasions has flown his aircraft safely back on three engines. During periods of the most extensive operations Flt. Lt. Barlow has set a magnificent example.

Act. Flt. Lt. E. L. D. BICKENSON, No. 218 Sqn. —In October, 1942, Flt. Lt. Bickenson, as captain of aircraft, was detailed for an attack on a target in Western Germany. His bomber was attacked by two enemy fighters, and in the ensuing engagement sustained severe damage. Displaying superb airmanship, this officer flew the aircraft back to base. On another occasion when on a sortie to Frankfurt his aircraft was attacked by two fighters, but despite the serious damage inflicted he pressed home his attack and bombed the target successfully. More recently, during an attack on Berlin, Flt. Lt. Bickenson's aircraft was illuminated by searchlights and subjected to heavy anti-aircraft fire, but with resolute determination this officer successfully completed his mission and returned safely to base.

The King congratulating Flt. Lt. J. C. McCarthy (an American serving in the R.C.A.F.) on winning the D.S.O. in the bombing of the Dams.

Act. Flt. Lt. B. D. CAYFORD, No. 7 Sqn.—This officer has participated in numerous bombing sorties. Flt. Lt. Cayford has displayed outstanding ability as a navigator, which has been reflected in the successes achieved.

Act. Flt. Lt. A. R. CRADDOCK, R.A.F.V.R., No. 15 Sqn.—Flt. Lt. Craddock has taken part in many sorties, including three attacks on Turin and two on Genoa. During a recent sortie, whilst over the target area, his aircraft was attacked by two enemy fighters. Although the bomber was damaged in the ensuing engagement, one of the attackers was shot down.

Act. Flt. Lt. L. N. G. DOIG, R.A.F.V.R., No. 9 Sqn.—Flt. Lt. Doig has taken part in a large number of operational sorties. As a navigator he has shown a very high degree of skill and has been largely responsible for the successful conclusion of attacks on distant and heavily defended targets.

Act. Flt. Lt. W. L. FARQUHARSON, R.A.F.V.R., No. 115 Sqn.—On one occasion this officer made a low level attack in full moonlight on a target well within the borders of Germany. The flight demanded very accurate navigation, but Flt. Lt. Farquharson identified the target and attacked twice in the face of exceptionally heavy opposition. His aircraft sustained much damage, but nevertheless he made another run over the target to secure a photograph which proved most valuable.

Act. Flt. Lt. E. M. GRAY, R.N.Z.A.F., No. 156 Sqn.—This officer has flown on many operational sorties against targets in Germany, Italy and enemy occupied territory. In the early part of his operational tour this officer was forced to leave his aircraft by parachute, and twice his aircraft has been damaged by anti-aircraft fire. Despite these trying experiences Flt. Lt. Gray's enthusiasm for operational flying remains undiminished.

Act. Flt. Lt. D. W. HENRY, R.C.A.F., No. 214 Sqn.—This officer has been squadron bombing leader since July, 1942. A high proportion of the sorties in which he has participated has been against important targets, where much opposition was encountered. Many of his sorties have been of long duration, calling for high navigational skill.

Act. Flt. Lt. R. HOWATSON, No. 115 Sqn.—This officer has been engaged as an air gunner on active operations since the commencement of hostilities. Before commencing his second tour of operational duty Flt. Lt. Howatson completed a period of 12 months as Instructor at an O.T.U., gaining invaluable experience which he has since utilised to the fullest extent during operations. He has participated as mid upper gunner in sorties on all the more heavily defended German targets, including Essen and Bremen.

Act. Flt. Lt. S. G. HOWE, R.A.F.V.R., No. 35 Sqn.—During severe winter weather, over a wide range of targets, including the majority of the enemy's most heavily defended areas, Flt. Lt. Howe has completed his missions with unvarying success.

Act. Flt. Lt. G. D. S. KOESTER, R.C.A.F., No. 109 Sqn.—Flt. Lt. Koester has made a large number of operational sorties. He has invariably displayed a high degree of navigational skill.

Act. Flt. Lt. J. O. LANCASTER R.A.F.V.R., No. 12 Sqn.—Flt. Lt. Lancaster has taken part in many operational sorties which have often been of a highly dangerous and difficult nature. On a mission to Essen in March, 1943, his aircraft was illuminated by searchlights and subjected to heavy attack from the ground defences. Flt. Lt. Lancaster displayed exceptional coolness and courage in extracting his aircraft from a perilous situation.

Act. Flt. Lt. T. H. LANE, R.C.A.F., No. 35 Sqn.—Flt. Lt. Lane, a gallant captain of aircraft, has flown on operations against some of the enemy's most important targets, always displaying great determination to complete his mission successfully.

Act. Flt. Lt. H. B. MACDONALD, No. 35 Sqn.—Flt. Lt. MacDonald has completed a large number of operational sorties against the enemy's most heavily defended targets. On all occasions he has displayed skill and determination.

Bombing Leader

Act. Flt. Lt. V. A. MULHALL, R.C.A.F., No. 214 Sqn.—Flt. Lt. Mulhall has been navigation officer in his squadron for eleven months, during three months of which he has also performed the duties of bombing leader. Despite his duties as squadron navigational officer, Flt. Lt. Mulhall has taken part in a large number of operational sorties. Twice on recent occasions he has returned with excellent photographs of the aiming point.

Act. Flt. Lt. J. G. NEILSON, R.N.Z.A.F., No. 218 Sqn.—Flt. Lt. Neilson has served with his present squadron since October, 1942, and has completed many successful sorties. On one occasion in December, 1942, when participating in an attack on Frankfurt, his aircraft was subjected to intense anti-aircraft fire and one engine was rendered useless. Nevertheless, Flt. Lt. Neilson continued his mission and pressed home his attack successfully. On another occasion, despite severe damage sustained by his aircraft, this officer made two runs over his target to ensure that his bombs were placed accurately.

Act. Flt. Lt. P. G. POWELL, R.C.A.F., No. 35 Sqn.—During his many sorties against enemy targets, Flt. Lt. Powell has displayed exceptional ability as a navigator. With unfailing accuracy he has consistently brought his aircraft to the target.

Act. Flt. Lt. G. N. REEVE, R.A.A.F., No. 75 Sqn.—Flt. Lt. Reeve has flown on operations against many of the enemy's most heavily defended targets, often successfully completing his mission in the face of intense opposition.

Act. Flt. Lt. H. K. STINSON, R.C.A.F., No. 102 Sqn.—This officer has completed a large number of operational sorties on important targets such as Berlin, Kiel, Essen, and on Genoa and Turin in Italy. On several occasions this captain has encountered severe opposition from anti-aircraft fire and enemy fighters.

Act. Flt. Lt. J. C. THELWELL, R.A.F.V.R., No. 109 Sqn.—Between February and June, 1941, this officer completed numerous offensive sorties against heavily defended targets in occupied France. Flt. Lt. Thelwell also completed two sorties against the German warships when at Brest. Since December, 1942, he has participated in a number of sorties, the majority of which have been against industrial targets in Western Germany, where considerable opposition was encount red.

Act. Flt. Lt. L. L. THOMAS, R.A.F.V.R., No.

SERVICE AVIATION

SERVICE AVIATION

35 Sqn.—Flt. Lt. Thomas is a most determined and efficient bomb-aimer. He has completed numerous successful sorties, several of them of a particularly dangerous nature, and has invariably displayed a complete disregard for the fierce opposition which he has encountered.

Act. Flt. Lt. L. G. TROTT, R.N.Z.A.F., No. 75 (N.Z.) Sqn.—Flt. Lt. Trott has proved himself a most outstanding captain of aircraft, whose success has been amply demonstrated by excellent photographs. On one occasion, when detailed to attack a heavily defended coastal target, owing to lack of engine power he was unable to climb over 10,000 feet. As a result, speed and manœuvrability were lost and the aircraft suffered damage from the ground defences. Although petrol was lost owing to this damage, Flt. Lt. Trott skilfully flew the aircraft to base and made a safe landing.

Act. Flt. Lt. D. J. B. WILSON, R.A.F.V.R., No. 196 Sqn.—This officer has completed numerous operational missions, flying on many occasions to targets such as Cologne, Berlin, Kiel and Hamburg, where the fiercest opposition is encountered.

F/O. R. G. ARMSTRONG, R.A.F.V.R., No. 49 Sqn.—The operational sorties in which this officer has participated have ranged from the Baltic to Italy and have included low-level night attacks and missions to Berlin and the Ruhr. Under his captaincy, his crew have achieved most satisfactory results, and photographic evidence has proved the value of his sorties. Though damage from anti-aircraft fire has been sustained on more than one occasion, he has remained unperturbed.

Every Type of Target

F/O. C. K. ASTBURY, R.A.A.F., No. 49 Sqn.—This officer took part in the daylight raids on Milan and Le Creusot with great success. The accuracy of his bombing on these occasions set the standard for the rest to follow. He has taken part in sorties on every known type of target and every kind of operation. F/O. Astbury is invariably careful to bomb only the correct target, and his work is characterised by a rigid determination to complete his orders.

F/O. A. D. BARKER, R.A.F.V.R., No. 35 Sqn.—On many occasions this officer has demonstrated his skill as a wireless operator. His work has been marked by coolness and efficiency which have largely contributed to the successes achieved.

F/O. E. W. BENNEE, R.A.F.V.R., No. 101 Sqn.—F/O. Bennee has successfully completed a tour of operational duty, during which he showed courage and determination in face of the enemy. In August, 1942, one engine of his aircraft failed when over Belgium, but by superb airmanship he flew safely back to base on the remaining engine.

F/O. D. A. CODD, R.A.F.V.R., No. 10 Sqn.—F/O. Codd is a navigator of high merit and has participated in many successful sorties against the most heavily defended areas in Germany. Although his aircraft has on several occasions sustained severe damage, he has remained unflurried.

F/O. H. COOKE, R.A.F.V.R., No. 156 Sqn.—This officer has participated in many operational sorties both by day and night. He has an excellent operational record, and on several occasions returned to base in a badly damaged aircraft.

F/O. J. COWAN, R.N.Z.A.F., No. 9 Sqn. (since deceased).—F/O. Cowan has at all times displayed an unswerving determination to perform his tasks successfully. This officer has also obtained many excellent photographs at night.

F/O. N. A. CRESSWELL, R.N.Z.A.F., No. 161 Sqn.—F/O. Cresswell, a first-class captain of aircraft, has completed 30 operational sorties. On one occasion, when flying over enemy territory, one engine of his aircraft failed, but he skilfully flew safely back to this country, where he made a masterly crash landing.

F/O. R. J. EMMERSON, R.A.A.F., No. 192 Sqn.—F/O. Emmerson has always displayed the greatest enthusiasm to participate in operational flying. He has taken part in attacks on some of the enemy's most heavily defended targets in Germany and occupied Europe.

F/O. H. J. FINCH, R.A.F.V.R., No. 101 Sqn.—Since September, 1942, this officer has flown on many successful sorties. He has displayed exceptional ability, which, combined with a high sense of discipline and responsibility, has had an excellent effect on the crews with whom he has flown.

F/O. S. R. GREEN, R.A.F.V.R., No. 78 Sqn.—F/O. Green has participated in operational sorties against German and Italian targets, which have included Berlin, Genoa and Turin. F/O Green has displayed courage and initiative, and the excellent photographs which have been obtained have proved the success of his attacks.

F/O. P. D. HALLAM, R.A.F.V.R., No. 97 Sqn.—F/O. Hallam is a capable navigator who has taken part in attacks on many heavily defended targets in Germany and Italy, including the daylight raid on Milan.

F/O. M. H. HEWES, R.A.F.V.R., No. 12 Sqn.—This officer has participated in many operational sorties and has proved to be a navigator of exceptional ability. He has attacked targets at Milan, Munich, Berlin, Essen, Cologne and Wilhelmshaven, often in the face of severe opposition.

F/O. A. M. M. HILL, D.F.M., R.A.F.V.R., No. 76 Sqn.—Since the award of the D.F.M., this officer has completed numerous sorties as wireless operator/air gunner. Operations in which he has participated have included attacks on very heavily defended targets in Germany, including Berlin, which he has attacked eleven times. By far the greater part of his sorties have been of a long and arduous nature.

F/O. D. JOHNSON, No. 35 Sqn.—On returning from a successful sortie against Genoa in November, 1942, the aircraft in which he was flying as air gunner crashed and three members of the crew were killed and the remainder, including F/O. Johnson, were seriously injured. After his release from hospital he returned to operational duties with unabated enthusiasm, and has taken part in many missions to important targets.

F/O. J. C. MCCARTHY, R.C.A.F., No. 97 Sqn.—On many occasions this officer has attacked targets in Germany. As captain of aircraft, he has participated in sorties to the heavily defended objectives in the Ruhr, and took part in the successful raid on Essen on the night of March 12, 1943. He has also attacked Berlin three times and Italian targets on five occasions.

F/O. R. W. MACMILLAN, R.A.F.V.R., No. 158 Sqn.—F/O MacMillan has proved himself to be an exceptionally keen and efficient navigator. By his work and example, the standard of navigation throughout the squadron has been raised appreciably.

F/O. A. MUIR, R.A.F.V.R., No. 7 Sqn.—As an air gunner, this officer has completed 35 night attacks on German and Italian targets. Throughout this period he has shown determination and courage of a high order.

F/O. A. MURRAY, D.F.M., No. 115 Sqn.—Since being awarded the D.F.M., F/O. Murray has participated in numerous operational missions, including attacks on Turin, Stuttgart, Mannheim, Lorient and St. Nazaire. He has invariably displayed great coolness in the face of the enemy and his excellent marksmanship has, on many occasions, contributed to the safe return of his aircraft.

F/O. D. L. POPPELWELL, No. 75 (N.Z.) Sqn.—F/O. Poppelwell is a most keen and determined air bomber who has achieved a fine operational record. His skill has been responsible for much of the success and the excellent photographs obtained by his crew.

F/O. A. J. DE L. RUTTLEDGE, R.C.A.F., No. 158 Sqn.—During the last few months this officer has participated in a large number of missions, the success of which has been largely owing to his leadership and skill as a pilot.

F/O. W. J. R. SCOLLAY, R.N.Z.A.F., No. 75 (N.Z.) Sqn.—As navigator, this officer has in no small measure added to the successes achieved by his captain. This officer has taken part in operations against Nuremberg, Bremen, Kiel and Turin, and also in many minelaying sorties.

F/O. C. A. J. SMITH, R.A.F.V.R., No. 83 Sqn.—Throughout his operational career F/O. Smith has been employed in attacking, almost exclusively, the most dangerous targets in Germany, and has never failed to press home his mission in the face of the fiercest opposition. On one occasion F/O. Smith's gunners were able to shoot down an enemy fighter before any damage had been inflicted on their own aircraft.

F/O. J. W. WARREN, R.A.F.V.R., No. 51 Sqn.—This officer has a long record of operational flying. Commencing in October, 1940, he took part in attacks against such heavily defended targets as Berlin, Essen, Dusseldorf and Gelsenkirchen. Later he served in the Middle East, where he flew on operations against targets in Greece, Crete, Italy, Cyrenaica, Sicily and Tripoli. Returning to England, F/O. Warren participated in the 1,000-bomber raids. More recently he has taken part in sorties to Cologne, Hamburg, Essen.

P/O. W. ALLAN, R.A.F.V.R., No. 10 Sqn.—Since August, 1942, P/O. Allan has successfully completed numerous operational sorties. In October, 1942, he made a low level attack on Flensburg in the face of terrific ground opposition and returned to base with 28 holes in his aircraft.

P/O. T. H. ANDERSON, R.A.F.V.R., No. 106 Sqn.—During his operational career P/O. Anderson has taken part in many raids on enemy naval bases and on industrial targets in Germany and Italy. He has also made several attacks on Berlin.

Crash Landing

P/O. F. BALDWIN, R.A.F.V.R., No. 115 Sqn.—As pilot, this officer has completed sorties against many heavily defended targets, the success of which can be attributed to his untiring devotion to duty and fine fighting spirit. On one occasion, when his aircraft was fully loaded, he was compelled to make a forced landing after a technical failure had occurred. Although his aircraft struck two trees while descending, he maintained control and executed a masterly landing, causing only minor damage to the bomber. On another occasion, during a daylight attack on a target in Germany, this officer descended so low that his aircraft was thrown out of control by the explosion of his bombs.

P/O. W. J. M. BARCLAY, D.F.M., R.N.Z.A.F., No. 156 Sqn.—Since being awarded the D.F.M. this officer has completed a number of sorties. He has continued to display exceptional skill in navigating his aircraft, and always the greatest keenness to take part in operations.

P/O. S. BERNARD, R.C.A.F., No. 7 Sqn.—P/O. Bernard has completed 39 operational sorties in heavy bomber aircraft, always displaying courage and determination of a high order.

P/O. N. E. BOHN, D.F.M., No. 467 (R.A.A.F.) Sqn.—This officer has taken part in a large number of operational sorties, including successful attacks against such heavily defended targets as Essen, Berlin, Hamburg, and daylight operations against Le Creusot and Milan.

P/O. T. H. BOWEN, No. 12 Sqn.—P/O. Bowen has an excellent record of operational flying. He has participated in many and varied operations, both by day and by night, including attacks against heavily defended targets in the Ruhr and at Milan. On one occasion, during an attack against Berlin, he encountered particularly heavy anti-aircraft fire and fighter opposition.

P/O. J. V. COCKSHOTT, R.A.F.V.R., No. 61 Sqn.—This officer has taken part in a large number of operational sorties, including attacks on targets at Berlin, Essen, Hamburg, Kiel, Genoa, Turin and Milan. P/O. Cockshott has set a magnificent example by his careful pre-flight planning of all details incidental to the operation.

P/O. N. A. COBB, R.C.A.F., No. 10 Sqn.—On his first sortie, when coned by searchlights and with his aircraft riddled by anti-aircraft fire, this officer, showing grim determination, dived from 17,000 to 6,000 feet, bombed his target, and obtained some excellent photographs. On another occasion, when on an operation at Bremen, P/O. Cobb's aircraft was fiercely attacked by a Ju 88. A running encounter ensued lasting ten minutes before the enemy fighter was finally destroyed.

P/O. A. J. F. DAVIDSON, R.A.F.V.R., No. 78 Sqn.—P/O. Davidson has participated in long distance flights to Italy and in attacks against targets in the most heavily defended areas in Germany. This officer invariably returns with excellent photographs.

P/O. C. A. DEAR, No. 12 Sqn.—This officer, as wireless operator, has taken part in a large number of successful sorties, including attacks against heavily defended targets at Milan, Essen, Bremen and Berlin, where fighter opposition was encountered.

CLEARING A RUNWAY: Infantrymen of the R.A.F. Regiment using their short bayonets to detect mines during a battle course.

Royal Australian Air Force

THE KING has been graciously pleased to approve the following award to a member of the Royal Australian Air Force, in recognition of gallantry displayed in flying operations against the Japanese:—

Distinguished Flying Cross

Sqn. Ldr. R. B. BURRAGE

Conspicuous Gallantry Medal (Flying)

Sgt. E. F. HICKS, No. 466 (R.A.A.F.) Sqn.—For citation see P/O. Hopkins, D.S.O.

Flt. Sgt. R. S. HOGG, No. 49 Sqn.—This airman has participated in a large number of operational sorties which have included a high proportion of attacks on Essen, Hamburg, and targets in the Ruhr.

Sgt. R. K. HEWITT, D.F.M., No. 61 Sqn.—This airman has completed a number of sorties since the award of the D.F.M. His courage and efficiency as a member of aircraft crew have always been of a very high order and have contributed much to the successful completion of many missions. On one occasion, when returning from an operational sortie, his aircraft was attacked by four enemy fighters. Sgt. Hewitt displayed the utmost courage and coolness in assisting to extinguish a fire which had resulted from the engagement.

Bar to Distinguished Flying Medal

Flt. Sgt. J. H. ALLEN, D.F.M., No. 83 Sqn.—Since the award of the D.F.M. this airman has completed numerous operational sorties. Map-reading and bomb-aiming duties have been performed with especial efficiency by this airman on many operations against heavily defended enemy objectives. In December, 1942, while on a raid on Frankfurt, one engine of his aircraft became disabled early on in the outward flight. Over the target the aircraft was heavily engaged by anti-aircraft fire and held in searchlights. Flt. Sgt. Allen, with great determination and coolness, gave his captain instructions for evasive action, and also directed him to the objective which was bombed accurately.

Flt. Sgt. E. H. MANTLE, D.F.M., No. 105 Sqn.—Since the award of the D.F.M., Flt. Sgt. Mantle has completed numerous operational flights as wireless operator. On two occasions, when damage has been sustained to the wireless equipment or when parts have become unserviceable, he has displayed admirable ingenuity in improvising repairs which have enabled the aircraft to contact base and assisted in making a safe landing.

Flt. Sgt. E. MILLS, D.F.M., No. 83 Sqn.—This airman has completed a number of operational sorties since being awarded the D.F.M. He has participated in attacks on the most heavily defended targets in Germany, including daylight sorties to Danzig and the Ruhr. On one occasion he was returning from Essen in an aircraft with only two engines functioning when it was attacked by two Me 110s and two Fw 190s. Flt. Sgt. Mills fought off the attackers, probably destroying one Fw 190. On several occasions his keenness and alertness in the air have enabled his captain to avoid engagements when on long-distance flights to the Baltic and Italy.

Distinguished Flying Medal

Sgt. F. C. BLAIR, No. 466 (R.A.A.F.) Sqn.—For citation see P/O. Hopkins, D.S.O.

Flt. Sgt. W. W. DRECHSLER, R.C.A.F., No. 150 Sqn.—In most hazardous circumstances this airman has displayed courage and fortitude worthy of the highest praise during air operations.

Flt. Sgt. (now P/O.) J. M. BISSETT, R.C.A.F., No. 78 Sqn.—Flt. Sgt. Bissett has displayed great courage and determination to accomplish his tasks successfully. He has taken part in many sorties, including attacks on various targets in the well-defended Ruhr area.

Flt. Sgt. T. S. COOK, No. 61 Sqn.—Flt. Sgt. Cook has participated in sorties including targets at Berlin, Bremen, Essen and Hamburg. In March, 1943, when returning from a mine-laying operation, his aircraft was attacked by four enemy fighters from close range. Owing to Flt. Sgt. Cook's skill his aircraft escaped serious damage and one of the attackers was observed to dive away out of control.

Flt. Sgt. I. CORNFIELD, No. 35 Sqn.—This airman has taken part in a large number of operational sorties and has invariably displayed keenness. His skilful advice and vigilance have enabled his captain to avoid enemy attackers and thus contributed greatly to the success of the sorties.

Flt. Sgt. A. K. COX, No. 101 Sqn.—Flt. Sgt. Cox is a courageous and efficient air-gunner who has taken part in numerous sorties over enemy occupied territory.

Flt. Sgt. G. CURRY, No. 77 Sqn.—Flt. Sgt. Curry has taken part in a large number of operational sorties and anti-submarine patrols. In July, 1942, the aircraft in which he was flying on patrol over the Bay of Biscay was attacked by an enemy fighter. The front gunner was severely wounded. Flt. Sgt. Curry completed his task, and after assisting his wounded comrade from the forward position continued to man the guns until the attack was frustrated.

Flt. Sgt. T. E. DONE, No. 467 (R.A.A.F.) Sqn.—This airman has participated in attacks on a wide variety of targets, including Berlin, Essen, Cologne, Bremen, and many other well-defended areas; he also flew on the daylight raids on Le Creusot and Milan.

Flt. Sgt. J. F. EDWARDS, No. 61 Sqn.—This airman has completed numerous operational sorties over very heavily defended targets in Germany, including Berlin, Hamburg, Cologne and Essen.

Flt. Sgt. S. EWEN, No. 10 Sqn.—In October, 1942, when crossing the Alps on the way to Genoa, the inter-communication system in Flt. Sgt. Ewen's aircraft failed. He dismantled the set and restored it to serviceability within an hour.

Flt. Sgt. J. H. GILMORE, R.C.A.F., No. 101 Sqn.—In the face of all hazards he has frequently completed his mission successfully, despite strong enemy opposition. During an attack against Turin in December, 1942, he bombed the target successfully, undeterred by exceptionally adverse weather. One night in December, 1942, by skilful airmanship, he evaded three attacks by enemy night fighters. Flt. Sgt. Gilmore also proved his ability to deal with difficult situations during an attack on Essen in January, 1943. His aircraft was severely damaged by anti-aircraft fire and the wireless operator wounded, but by cool and calculated handling of the aircraft Flt. Sgt. Gilmore again reached home safely.

Flt. Sgt. L. J. HAMPTON, No. 10 Sqn.—Whilst returning from a raid on Essen recently Flt. Sgt. Hampton's aircraft was shot down into the sea in the vicinity of the Dutch coast. He and his crew were rescued three days later by an Air/Sea Rescue Launch after undergoing extreme hardships. The rescue was completed under fire from three enemy "E" boats. In spite of this grim ordeal, this captain has continued to operate with undiminished ardour. During an attack on Kiel in October, 1942, his aircraft was illuminated by searchlights and repeatedly hit by gun fire. In spite of this Flt. Sgt. Hampton dived down from 14,000 ft. to 6,000 ft. to bomb, and secured outstanding photographs.

Flt. Sgt. G. E. HEATH, R.A.A.F., No. 460 Sqn.—This airman has taken part in many successful sorties, including a raid on Milan and three on Berlin; his last sortie was against the last named city on the night March 1st, 1943.

Flt. Sgt. G. JACKSON, No. 207 Sqn.—This airman is an enthusiastic and efficient air gunner, who has completed a large number of operational missions, which have included many raids on industrial centres in Germany and a successful daylight attack on Le Creusot. On one occasion, when engaged in mine laying, he effectively attacked enemy anti-aircraft ships and thereby contributed largely to the success of the sortie.

Utmost Courage

Flt. Sgt. D. J. MCCOY, R.C.A.F., No. 78 Sqn.—As air gunner Flt. Sgt. McCoy has taken part in many operational sorties, always showing the utmost courage in the face of the enemy. Recently he has flown on operations to Berlin and the Ruhr.

Flt. Sgt. A. W. MACRAE, R.A.A.F., No. 460 (R.A.A.F.) Sqn.—This airman has served as an air bomber, successfully completing 30 operational sorties over Germany and Occupied Europe, including two raids on Essen, where he obtained hits on the Krupps works.

Flt. Sgt. J. MCCRUM, No. 156 Sqn.—During his service with the squadron this airman has displayed exceptional knowledge and skill in the performance of his duties. He has participated in operational sorties against objectives in Germany, Italy and occupied territory, which have been attended with a large measure of success.

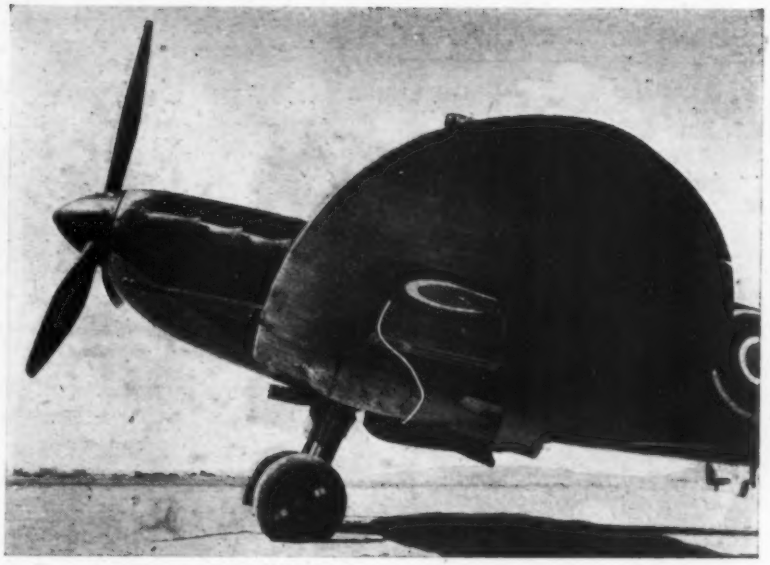
Flt. Sgt. (now P/O.) C. P. MCDONALD, R.C.A.F., No. 9 Sqn.—This airman is an outstanding captain of aircraft who has invariably exhibited the greatest keenness and enthusiasm for operations. He always presses home his attacks with the utmost vigour, and has completed operations against many of the most strongly defended objectives in enemy territory, including Bremen, Essen and Le Creusot. On two occasions, undeterred by the failure of one engine, before leaving the English coast, he has continued and successfully located and bombed his target.

Flt. Sgt. P. H. MCKENNA, No. 12 Sqn.—Flt. Sgt. McKenna, who is now serving on his second tour of operations, has participated in sorties against Munich, Wilhelmshaven, Cologne and Essen.

Flt. Sgt. G. MADDERN, R.A.A.F., No. 103 Sqn.—Since October, 1942, this airman has taken part in many operational sorties, always pressing home his attacks with accuracy and determination and often obtaining excellent photographs.

Flt. Sgt. J. N. P. MARTIN, No. 49 Sqn.—Flt. Sgt. Martin has participated in many operational sorties. He has always shown outstanding ability as a gunner and wireless operator. On the many occasions that Flt. Sgt. Martin's aircraft has been subjected to accurate and intense gunfire when over the target area, he has consistently given his captain the greatest possible assistance.

Flt. Sgt. J. W. MOORE, R.A.A.F., No. 460 (R.A.A.F.) Sqn.—Flt. Sgt. Moore, a wireless operator of very high calibre, has completed 30 operational sorties against targets in Germany, Italy and Occupied France, including Lorient, St. Nazaire, Berlin and Essen.



CANNON AND BOMB: A mark V Spitfire with 250 lb. bombs fitted under the wing. This famous fighter now provides height-cover and zero-ft. strafing.

100ft. Over Lorient

Flt. Sgt. C. PASSINGHAM, No. 214 Sqn.—As air gunner, Flt. Sgt. Passingham has taken part in a large number of operational sorties over Germany and the occupied countries. On three of these he has used his guns most effectively on ground targets, damaging enemy trains and a factory. He also attacked enemy searchlights at Lorient from a height of only 100 feet. Flt. Sgt. Passingham's aircraft has been attacked by enemy night fighters on several occasions, once by three Me 110s at the same time. Recently on two occasions he has been engaged in air combats with hostile aircraft, but each time, owing to his fine gunnery, the attack has been frustrated. This airman has been involved in several bad crashes, but despite this his enthusiasm is undiminished.

Flt. Sgt. E. POVEY (now P/O.), No. 207 Sqn.—This airman, a most able and efficient navigator, has participated in sorties against targets in Berlin, Essen and Turin, the success of which has been largely due to his cool determination regardless of difficulties.

Flt. Sgt. J. RENVOIZE, No. 138 Sqn.—A wireless operator of great ability, Flt. Sgt. Renvoize has completed 43 operational sorties. On several occasions, in adverse weather, his efficiency and resourcefulness has enabled his aircraft to make a safe return.

Flt. Sgt. I. R. RICHARDSON, R.A.A.F., No. 460 (R.A.A.F.) Sqn.—This airman has taken part in many operational sorties over Germany, Occupied France and Italy. In the height of attack, Flt. Sgt. Richardson has shown a quiet confidence, checking his calculations with a calm deliberation and thus contributing largely to the safe return of the bomber through heavily defended zones.

Flt. Sgt. L. ROBERTS, No. 161 Sqn.—Flt. Sgt. Roberts has flown on operations since the beginning of the war. A first-class wireless operator, he inspires confidence in all with whom he flies.

Flt. Sgt. A. R. ROWSELL, R.N.Z.A.F., No. 207 Sqn.—This airman has participated in many operational sorties against heavily defended targets in Germany. He also took part in the highly successful daylight raids on Le Creusot and Milan. On one occasion when his aircraft was attacked by enemy fighters much damage was sustained which rendered the aircraft difficult to control. Flt. Sgt. Rowsell acted as fire controller from the astrodome until the attackers broke away. This airman then released the rear gunner who was trapped in his damaged turret, afterwards assisting his pilot to control the aircraft.

Flt. Sgt. J. A. SAINT-SMITH, R.A.A.F., No. 460 (R.A.A.F.) Sqn.—This airman has displayed out

SERVICE AVIATION

standing determination in pressing home his attacks on enemy targets during numerous operational sorties. Early in March, 1943, he participated in a raid on Berlin and obtained an excellent photograph after the bombs had been released. He has, at all times, taken great care to identify the target, and has, as pilot, done all in his power to ensure accurate bombing.

Flt. Sgt. J. B. SCANNELL, No. 35 Sqn.—This airman has displayed a highly commendable degree of skill and resource during the numerous operational attacks in which he has participated. Many of these have been against very strongly defended targets in enemy territory. On a number of occasions night fighter opposition has been encountered and skilfully evaded largely owing to the directions given by this air gunner. The safe and undamaged return of his aircraft from many sorties must be largely credited to him.

Flt. Sgt. R. A. SHANNON, R.C.A.F., No. 78 Sqn.—This airman has proved himself one of the keenest air gunners in the squadron. On every occasion he has displayed the utmost coolness and courage in the face of the enemy. Despite the fierce opposition which he has encountered over the most heavily defended targets in Germany and enemy occupied territory, Flt. Sgt. Shannon has maintained an undiminished enthusiasm for operations.

Awards of Foreign Decorations

Royal Air Force

THE KING has granted unrestricted permission for the wearing of the undermentioned decorations, conferred on the officers indicated, in recognition of valuable services rendered in connection with the war:—

Conferred by the King of the Helenes

Greek Air Force Cross

Act. Flt. Lt. G. E. LEWIS, R.A.F.V.R.

Conferred by the Queen of the Netherlands

Commander of the Order of Orange Nassau

Air Comdre. J. M. MASON, D.S.C., D.F.C.

Conferred by the Belgian Government

Croix de Guerre Belge

Act. Wing Cdr. C. F. CURRANT, D.S.O., D.F.C.
Act. Wing Cdr. I. R. GLEED, D.S.O, D.F.C.

Roll of Honour

Casualty Communiqué No. 240.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in the list, 107 are second entries, giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Act. Sqn. Ldr. J. H. Bachmann; F/O. W. G. Cooper; Sgt. W. H. Fletcher; Sgt. G. A. March; Flt. Sgt. D. P. Robertson; L.A/C. L. B. Whitfield.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. D. W. Baird; Sgt. A. M. Bee; Sgt. A. Bentham; Sgt. D. McC. Brown; Sgt. J. Brown; Sgt. W. J. Callaghan; Flt. Sgt. P. T. Candler; Flt. Sgt. A. W. Dormand; Sgt. E. W. Finch; P/O. W. E. Gregory; Flt. Sgt. R. W. A. Hawkesworth; P/O. D. Hudson; Flt. Sgt. R. Hunt; Sgt. N. A. Lowden; Flt. Lt. D. H. McArthur, D.F.C.; Sgt. L. W. Mallow; Act. Sgt. A. R. V. Matthissen; Sgt. A. R. Pain; Act. Flt. Lt. A. B. Payne, D.F.C.; P/O. I. R. J. Perkins; Sgt. B. Sigler; Sgt. F. W. Thornton; Sgt. J. Wise.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. J. H. A. Baker; Sgt. J. Boyd; P/O. C. D. Brown; Flt. Sgt. D. Campbell; Sgt. E. B. Cliff; Sgt. A. T. P. Considine; Flt. Sgt. J. McN. Davidson; Sgt. J. R. Dodd; P/O. P. Eastman; Sgt. E. E. Fairhurst; Flt. Sgt. T. Flanagan; Sgt. W. H. Flower; Sgt. H. L. Fraser; F/O. S. J. Fyson; Act. F/O. A. Gerrie; Act. Flt. Lt. R. Gillespie; Flt. Sgt. J. Hanna; Sgt. A. A. S. F. Harris; F/O. M. S. Job; Flt. Sgt. A. B. Johnson; Flt. Sgt. M. A. Jones; Sgt. B. A. T. Lane; F/O. A. N. McClintock; Sgt. R. A Marston; Flt. Sgt. J. B. Melvin; Sgt. D. R. I. Morgan; Sgt. C. Moseley; Sgt. L. J. Nelmes; Sgt. S. Palmer; Sgt. E. V. Pratt; Sgt. T. Pugh; Sgt. F. D. N. Row; Flt. Lt. R. R. Sandford; Sgt. E. Shepherd; Sgt. J. F. Staff; Flt. Sgt. R. A. J. Trevillan; Sgt. F. G. Truscott; Flt. Sgt. A. R. Vint; P/O. J. E. Ward; Flt. Sgt. L. Warren-Smith; Sgt. C. V. Webb; Sgt. F. White; Flt. Sgt. E. V. H. Wieland; Sgt. J. W. Wilkinson.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Act. Flt. Lt. E. Dickinson.

WOUNDED OR INJURED IN ACTION.—F/O. D. P. McLoughlin.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—F/O. A. Brierley.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. T. A. Bird; W/O. H. Holcombe; Sgt. A. J. Jackson; Sgt. K. Roberts; Sgt. N. G. Stopford; Sgt. R. McG. Wilson.

MISSING.—Flt. Sgt. F. H. Brough; Sgt. D. R. Carter; Flt. Sgt. F. Cave; Sgt. J. G. Chalmers; Sgt. S. F. W. Chappell; P/O. E. C. Cole; Sgt. S. Corderoy; P/O. H. B. Currall; Sgt. R. A. Damms; Sgt. T. R. Davidson; Sgt. T. Dawson; P/O. R. F. Downes; Flt. Sgt. D. B. Dray; Sgt. R. E. Edgley; Sgt. R. A. Edmonds; Sgt. D. L. N. Eggleton; Sgt. J. E. Elwell; F/O. G. C. Fletcher; Sgt. J. Forrest; Sgt. F. L. Godden; Sgt. W. J. H. Green; Sgt. P. H. Griffiths; Sgt. C. J. Grimshaw; Sgt. R. C. L. Guest; Sgt. W. G. Harvey; Sgt. L. J. Hemus; Sgt. M. Hoope; Cpl. F. Horton; Sgt. J. L. Irvine; Act. Wing Cdr. A. D. Isemonger; Sqn. Ldr. L. W. Ivey; Flt. Sgt. E. A. Jeffery; Sgt. H. Jenkinson; Flt. Sgt. W. F. Jones; Sgt. A. C. Kneeshaw; Sgt. M. H. Knowles; P/O. C. C. Lee; P/O. I. F. Leng; Sgt. R. Leonard; Sgt. R. F. Limage; Sgt. J. McAllister; Sgt. J. McKenny; A/C.1 G. McLean; L.A/C. R. A. Mallard; L.A/C. H. T. Manley; Sgt. C. G. L. Marlin; F/O. J. R. May; A/C.1 A. G. Meaden; Sgt. E. Milne; Sgt. R. J. B. Montigue; F/O. D. H. W. Morgan; Sgt. S. S. Morrow; Sgt. W. Myerscough; Cpl. S. M. Parks; Sgt. A. D. Pennycord; Sgt. J. A. Prior; Sgt. A. Ridge; Flt. Sgt. S. J. G. Rutherford; Sgt. S. P. Shaw; Sgt. W. H. Shipp; Sgt. H. R. Simmonds; Sgt. F. A. Smith; Sgt. T. C. Somerville; Flt. Sgt. H. F. R. Stettiner; P/O. P. P. Stevens; Sgt. R. S. Sweetlove; Sgt. J. R. Tait; Sgt. L. J. Tate; Flt. Sgt. W. A. Tate; Sgt. D. A. S. Tomkins; F/O. J. E Townsend; Sgt J. Travis; Cpl. L. J. Treggiden; Sgt. R. Twiddy; Sqn. Ldr. H. D. Venables; F/O. S. H. Walpole; Sgt. J. C. Walton; L.A/C. F. A. Webb; Sgt. T. Whitehead; Sgt. S. M. Wood; P/O. P. S. Wright; Sgt. N. R. Yorke; F/O. M. E. Zillessen.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. E. Havron; P/O. C. Jackson; Sgt. J. A. W. Warrington.

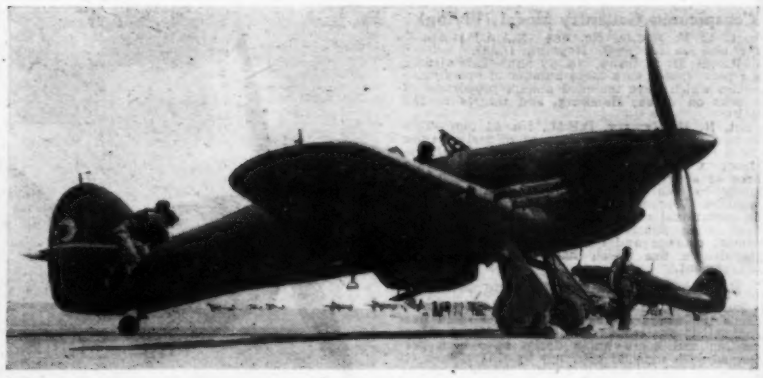
KILLED ON ACTIVE SERVICE.—Sgt. E. J. R. Ansell; Sgt. J. Barton; Sgt. N. K. Carew; Sgt. S. Colclough; L.A/C. G. Davison; P/O. I. J. Dixon; F/O. C. A. Fawcett; Sgt. L. Fitzgerald; Sgt. I. S. Glen; Flt. Lt. G. P. Hall, A.F.M.; L.A/C. J. A. Howard; F/O. J. R. Howard; Sgt. A. C. McL. McKenzie; Sgt. P. H. R. Moody; F/O. W. W. D. Pearl; Flt. Sgt. T. E. Procureur; Sgt. E. A. Robinson; Sgt. J. E. Taylor; Sgt. G. H. Wheatland.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. K. K. Ford; A/C.1 W. Moorhouse; Sgt. H. Rudd.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. E. T. Dawson; A/C.1 F. Riley; Sgt. W. W. Russell.

DIED ON ACTIVE SERVICE.—L.A/C. J. Blackburn; L.A/C. M. Danino; A/C.2 A. J. Manning; A/C.1 J. F. Parkin; A/C.2 F. T. Pritchard; Act. Sgt. T. F. Rumsey; Cpl. A. C. H. Weedon.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—P/O. A. J. Burton; Sgt. J. W. T. Duffield; Flt. Sgt. B. Guy; Sgt. A. G. Rusling.



ARMED NEUTRALITY: A Hurricane IIc being run-up on a Middle East airfield before being flown to Turkey.

He was too gay, too young, to die;
So young he hardly knew the worth
Of England where he'd had his birth.
That England 'neath a cloud-flecked sky
For which he died: so to deny
The terror of the blackened hearth
The savage grins of Hun-like mirth.
He only knew the joy on high,
The blazing sun and racing cloud,
The hamlets of his peaceful land,
The plaudits of his people proud.
"A friendly soul and very grand"
This epitaph is but his shroud
For those, so few, who understand.

J. L. P., June 10th, 1940.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. B. H. Edye; Sgt. C. A. Fletcher; Sgt. J. C. Hannaford; Sgt. V. E. M. Henry; P/O. J. E. Maloney; Sgt. C. N. Reynolds; Sgt. H. V. Warnock.

WOUNDED OR INJURED IN ACTION.—Sgt. P. L. Taylor.

MISSING, BELIEVED KILLED IN ACTION.—P/O. N. Ferguson; Flt. Sgt. R. H. Flett; Sgt. J. P. M. Grace; Sgt. S. White; Flt. Sgt. R. G. Younger.

MISSING.—Flt. Sgt. W. F. Allsopp; Flt. Sgt. J. H. Dodgshun; Flt. Sgt. J. L. Forrest; Flt. Sgt. F. W. G. Limbrick; P/O. D. I. Macdonald; Sgt. A. K. Meadows; Flt. Sgt. D. F. Walker.

KILLED ON ACTIVE SERVICE.—Sgt. W. T. Cuthbertson; Sgt. J. H. Norman.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. R. T. Clark; Flt. Sgt. R. W. Humphrey.

Royal Canadian Air Force

KILLED IN ACTION.—F/O. H. M. Rogers.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. L. G. Higginson; Flt. Sgt. E. N. Jeffries; Sgt. N. A. Payne; Flt. Sgt. A. R. White.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. R. J. W. Askwith; P/O. J. B. F. Brown; P/O. H. L. Cook; Flt. Sgt. R. I. Derry, Sgt. G. H. Ellis; Flt. Sgt. A. A. Hemery; P/O. J. R. Kennedy; Flt. Sgt. E. T. McGill; Act. Flt. Lt. J. J. Mooney; Sgt. K. B. Utman; P/O. G. H. Webster; P/O. J. C. Weir; P/O. W. Zoochkan.

WOUNDED OR INJURED IN ACTION.—Sgt. D. K. Seaman.

MISSING, BELIEVED KILLED IN ACTION.—F/O. H. C. Macquoid; Flt. Sgt. H. V. Tracey.

MISSING.—P/O. H. D. Baker; Sgt. J. McK. Bradford; F/O. R. M. Bull; Sgt. G. J. Darling; Flt. Sgt. J. H. Dillon; Sgt. W. J. Foley; Sgt. R. E. Goldney; P/O. J. E. Hardy; F/O. J. E. Leach; Sgt. W. F. Jordon; W/O. D. J. McKay; Act. Flt. Lt. J. A. McKinnon; P/O. B. H. Marion; P/O. H. J. Ross; Sgt. H. B. J. Sargent; Sgt. J. A. C. Taylor; P/O. R. J. Wright.

KILLED ON ACTIVE SERVICE.—Sgt. R. W. Wood.

Royal New Zealand Air Force

KILLED IN ACTION.—Sgt. H. L. Burt.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. G. R. Cameron; Flt. Sgt. K. J. Coakley; Sgt. R. J. Parish; Sgt. S. L. Wilton.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Act. Flt. Lt. T. J. D. Baber; Sgt. A. R. Batley; P/O. L. P. Bourke; Sgt. F. D. Glasgow; Sgt. D. A. S. Hamilton; Sqn. Ldr. R. R. Stewart; Sgt. R. D. J. Woodcock.

WOUNDED OR INJURED IN ACTION.—W/O. A. R. Campbell.

MISSING.—Flt. Sgt. D. Archibald; Flt. Sgt. W. J. Douglas; Sgt. W. P. Hermansen; Sgt. K. J. Johnson; F/O. S. Latta; Act. Flt. Lt. D. L. McCregor-McDonald; Sgt. F. W. Marshall.

KILLED ON ACTIVE SERVICE.—Sgt. V. J. Ackroyd.

South African Air Force

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. J. E. Forrest.

MISSING.—Lt. G. Lloyd, D.F.C.

KILLED ON ACTIVE SERVICE.—Cpl. H. W Marchant.

Official Corrections

To Casualty Communiqué No. 238.

Under R.C.A.F. "MISSING" delete Sgt. R. T. Wiggett.

To Casualty Communiqué No. 239.

Under "KILLED ON ACTIVE SERVICE" delete Sgt. G. F. Bridger.